ROSS' CELEBRATED LENSES

AND

ZEISS' AND GOERZ' ANASTIGMATS, &c.

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CALENDAR, 1897.

JANUARY.

S	...	3	10	17	24	31
M	...	4	11	18	25	...
T	...	5	12	19	26	...
W	...	6	13	20	27	...
T	...	7	14	21	28	...
F	1	8	15	22	29	...
S	2	9	16	23	30	...

FEBRUARY.

S	...	7	14	21	28	...
M	1	8	15	22	...	...
T	2	9	16	23	...	...
W	3	10	17	24	...	...
T	4	11	18	25	...	...
F	5	12	19	26	...	...
S	6	13	20	27	...	...

MARCH.

S	...	7	14	21	28	...
M	1	8	15	22	29	...
T	2	9	16	23	30	...
W	3	10	17	24	31	...
T	4	11	18	25	...	...
F	5	12	19	26	...	...
S	6	13	20	27	...	...

APRIL.

S	...	4	11	18	25	...
M	...	5	12	19	26	...
T	...	6	13	20	27	...
W	...	7	14	21	28	...
T	1	8	15	22	29	...
F	2	9	16	23	30	...
S	3	10	17	24	...	...

MAY.

S	...	2	9	16	23	30
M	...	3	10	17	24	31
T	...	4	11	18	25	...
W	...	5	12	19	26	...
T	...	6	13	20	27	...
F	...	7	14	21	28	...
S	1	8	15	22	29	...

JUNE.

S	...	6	13	20	27	...
M	...	7	14	21	28	...
T	1	8	15	22	29	...
W	2	9	16	23	30	...
T	3	10	17	24	...	...
F	4	11	18	25	...	...
S	5	12	19	26	...	...

JULY.

S	...	4	11	18	25	...
M	...	5	12	19	26	...
T	...	6	13	20	27	...
W	...	7	14	21	28	...
T	1	8	15	22	29	...
F	2	9	16	23	30	...
S	3	10	17	24	31	...

AUGUST.

S	1	8	15	22	29	...
M	2	9	16	23	30	...
T	3	10	17	24	31	...
W	4	11	18	25	...	...
T	5	12	19	26	...	...
F	6	13	20	27	...	...
S	7	14	21	28	...	...

SEPTEMBER.

S	...	5	12	19	26	...
M	...	6	13	20	27	...
T	...	7	14	21	28	...
W	1	8	15	22	29	...
T	2	9	16	23	30	...
F	3	10	17	24	...	...
S	4	11	18	25	...	...

OCTOBER.

S	...	3	10	17	24	31
M	...	4	11	18	25	...
T	...	5	12	19	26	...
W	...	6	13	20	27	...
T	...	7	14	21	28	...
F	1	8	15	22	29	...
S	2	9	16	23	30	...

NOVEMBER.

S	...	7	14	21	28	...
M	1	8	15	22	29	...
T	2	9	16	23	30	...
W	3	10	17	24	...	...
T	4	11	18	25	...	...
F	5	12	19	26	...	...
S	6	13	20	27	...	...

DECEMBER.

S	...	5	12	19	26	...
M	...	6	13	20	27	...
T	...	7	14	21	28	...
W	1	8	15	22	29	...
T	2	9	16	23	30	...
F	3	10	17	24	31	...
S	4	11	18	25	...	...

POSTAL AND TELEGRAPHIC ADDRESSES, 1081 to 1088.

For Several Important New Series of

ROSS' ZEISS' & GOERZ' LENSES

See pages 35 to 98.

ROSS & CO., 111 New Bond Street, London, W.
CORNER OF BROOK STREET.

JANUARY.

D. M.	D. W.	Remarkable Events.	Sun Rises. H. M.	Sun Sets. H. M.	Moon Rises. Morn.	Moon Sets. After
1	F		8 8	4 0	6 52	1 40
2	S		8 8	4 1	7 55	2 47
3	S	2nd Sun. after Christmas. Prof.	8 8	4 2	8 41	4 8
4	M	[J. W. Draper d. 1882. ● 6.3 M.	8 8	4 3	9 13	5 33
5	Tu		8 8	4 5	9 35	6 55
6	W	Epiphany	8 8	4 6	9 51	8 14
7	Th	Daguerreotype com. to Acad. of Sc.	8 7	4 7	10 4	9 28
8	F	[(Paris), 1839	8 7	4 8	10 16	10 40
9	S		8 6	4 10	10 27	11 50
10	S	1st Sun. after Epiphany. ☽ 9.46 A.	8 6	4 11	10 39	Morn
11	M		8 5	4 13	10 53	1 0
12	Tu		8 4	4 14	11 9	2 11
13	W	William Bedford d. 1893	8 3	4 16	11 30	3 23
14	Th		8 3	4 17	11 59	4 34
15	F	G. W. Simpson d. 1880	8 2	4 19	After	5 40
16	S		8 1	4 20	1 34	6 38
17	S	2nd Sunday after Epiphany	8 0	4 22	2 43	7 23
18	M	E. Lacan d. 1879. Rejlander d. 1875.	7 59	4 23	4 0	7 57
19	Tu	[○ 8.17 A.	7 58	4 25	5 22	8 23
20	W	Photo. Soc. of Lond. f. 1853	7 57	4 27	6 45	8 42
21	Th	Fox Talbot b. 1800	7 56	4 29	8 8	8 58
22	F	Sir W. Newton d. 1869	7 55	4 30	9 31	9 11
23	S		7 53	4 31	10 55	9 25
24	S	3rd Sunday after Epiphany	7 52	4 33	Morn	9 39
25	M	☾ 8.9 A.	7 51	4 35	0 20	9 56
26	Tu		7 50	4 37	1 48	10 17
27	W		7 48	4 39	3 16	10 48
28	Th	Photo-sculpture pat. by Willème,	7 47	4 40	4 38	11 31
29	F	[1863	7 45	4 42	5 46	After
30	S	Fox Talbot's first c. to Roy. Soc. 1839.	7 44	4 44	6 36	1 45
31	S	4th Sunday after Epiphany	7 42	4 46	7 12	3 7

JANUARY.

MEMORANDA.

For MEETINGS OF SOCIETIES, *see pp.* 548–597.

D. M.	D. W.
1	F
2	S
3	S
4	M
5	Tu
6	W
7	Th
8	F
9	S
10	S
11	M
12	Tu
13	W
14	Th
15	F
16	S
17	S
18	M
19	Tu
20	W
21	Th
22	F
23	S
24	S
25	M
26	Tu
27	W
28	Th
29	F
30	S
31	S

FEBRUARY.

D. M.	D. W.	Remarkable Events.	Sun Rises. H. M.	Sun Sets. H. M.	Moon Rises. Morn.	Moon Sets. After.
1	M	● 8.13 A.	7 41	4 48	7 37	4 29
2	Tu		7 40	4 50	7 55	5 50
3	W		7 38	4 51	8 10	7 6
4	Th		7 36	4 53	8 22	8 20
5	F		7 34	4 55	8 34	9 31
6	S		7 33	4 57	8 45	10 42
7	S	5th Sunday after Epiphany	7 31	4 58	8 58	11 53
8	M	Calotype Process pat. 1841	7 29	5 0	9 14	Morn
9	Tu	☽ 7.25 A.	7 27	5 2	9 33	1 5
10	W	Sir David Brewster d. 1868	7 26	5 4	9 57	2 16
11	Th		7 24	5 6	10 32	3 24
12	F		7 22	5 8	11 20	4 25
13	S	Leon Foucault d. 1868	7 20	5 10	After	5 16
14	S	Septuagesima Sun. St. Valentine	7 18	5 12	1 35	5 55
15	M	Oliver Sarony b. 1820	7 16	5 13	2 56	6 24
16	Tu	Glasgow Photo. Society found. 1860	7 14	5 15	4 20	6 45
17	W	○ 10 11 M.	7 12	5 17	5 45	7 2
18	Th	Moule's Photogen (artificial light for	7 10	5 19	7 10	7 17
19	F	[portraiture) pat. 1857	7 8	5 20	8 37	7 32
20	S	Poitevin's p. of Helioplastie pub. '55	7 6	5 22	10 4	7 45
21	S	Sexagesima Sunday	7 4	5 24	11 33	8 3
22	M		7 2	5 26	Morn	8 23
23	Tu		7 0	5 28	1 2	8 51
24	W	☾ 3.44 M.	6 58	5 30	2 27	9 30
25	Th		6 56	5 31	3 38	10 23
26	F	Senefelder d. 1834. Padre Secchi d.	6 54	5 33	4 34	11 31
27	S	[1876. Arago b. 1786	6 52	5 35	5 14	After
28	S	Quinquagesima (Shrove) Sunday.	6 50	5 37	5 42	2 11

FEBRUARY.

D. M.	D. W.	MEMORANDA.
1	M	*For* MEETINGS OF SOCIETIES, *see pp.* 548–597.
2	Tu	
3	W	
4	Th	
5	F	
6	S	
7	S	
8	M	
9	Tu	
10	W	
11	Th	
12	F	
13	S	
14	S	
15	M	
16	Tu	
17	W	
18	Th	
19	F	
20	S	
21	S	
22	M	
23	Tu	
24	W	
25	Th	
26	F	
27	S	
28	S	

MARCH.

D. M.	D. W.	Remarkable Events.	Sun Rises. H. M.	Sun Sets. H. M.	Moon Rises. Morn.	Moon Sets. After.
1	M		6 47	5 38	6 2	3 31
2	Tu		6 45	5 40	6 17	4 47
3	W	● 11.56 M	6 43	5 42	6 30	6 2
4	Th	Poitevin d. 1882	6 41	5 44	6 42	7 15
5	F	La Place d. 1827. J. Albert b. 1825	6 39	5 45	6 54	8 25
6	S	Fraunhofer b. 1787	6 37	5 47	7 6	9 37
7	S	1st Sun. in Lent. J. N. Niepce	6 34	5 49	7 20	10 48
8	M	[b. 1765. Herschel b. 1792	6 32	5 51	7 36	11 59
9	Tu	G. W. Wilson d. 1893	6 30	5 52	7 59	Morn
10	W		6 28	5 54	8 30	1 8
11	Th	St. Claire Deville b. 1818. ☽ 3.28 A.	6 25	5 56	9 11	2 12
12	F		6 23	5 58	10 5	3 7
13	S	[hypo for fixing, 1839	6 21	5 59	11 12	3 49
14	S	2nd Sun. in Lent. Herschel int.	6 19	6 1	After	4 21
15	M	F. A. Wenderoth d. 1884	6 16	6 2	1 51	4 46
16	Tu		6 14	6 4	3 14	5 6
17	W		6 12	6 6	4 40	5 22
18	Th	○ 9.28 A.	6 10	6 8	6 6	5 37
19	F	Thos. Sutton d. 1875	6 7	6 9	7 35	5 52
20	S		6 5	6 11	9 7	6 8
21	S	3rd Sunday in Lent	6 3	6 13	10 39	6 27
22	M		6 1	6 15	Morn	6 53
23	Tu		5 58	6 16	0 9	7 28
24	W	Becquerel b. 1820	5 56	6 18	1 28	8 18
25	Th	Hermagis d. 1868 ☾ 0.0 A.	5 53	6 19	2 31	9 23
26	F		5 51	6 21	3 15	10 40
27	S		5 49	6 23	3 46	After
28	S	4th Sunday in Lent. La Place b.	5 47	6 25	4 8	1 19
29	M	[1749	5 44	6 26	4 24	2 36
30	Tu		5 42	6 28	4 37	3 50
31	W		5 40	6 30	4 50	5 1

MARCH.

D. M.	D. W.	MEMORANDA
1	M	
2	Tu	*For* Meetings of Societies, *see pp.* 548–597.
3	W	
4	Th	
5	F	
6	S	
7	S	
8	M	
9	Tu	
10	W	
11	Th	
12	F	
13	S	
14	S	
15	M	
16	Tu	
17	W	
18	Th	
19	F	
20	S	
21	S	
22	M	
23	Tu	
24	W	
25	Th	
26	F	
27	S	
28	S	
29	M	
30	Tu	
31	W	

APRIL.

D. M.	D. W.	Remarkable Events.	Sun. Rises. H. M.	Sun. Sets. H. M.	Moon. Rises. Morn.	Moon. Sets. After.
1	Th		5 38	6 31	5 2	6 12
2	F	First Sun Photo. by Fizeau and Fou-	5 36	6 33	5 14	7 23
3	S	[cault, '45. Morse d. '72. ● 4.24 M.	5 33	6 34	5 27	8 35
4	S	5th Sunday in Lent [b. 1795	5 31	6 36	5 43	9 46
5	M	Rev. J. B. Reade b. 1801. Isid. Niepce	5 28	6 38	6 5	10 55
6	Tu	[Victor d. 1870	5 26	6 40	6 31	Morn
7	W	Voigtländer d. 1878. Niepce de St.	5 24	6 41	7 7	0 1
8	Th	[1839	5 22	6 43	7 57	0 58
9	F	Fox Talbot's First Art. in *Athenæum*,	5 20	6 44	9 0	1 45
10	S	Pouncy's Carbon Process pat. 1858.	5 18	6 46	10 9	2 20
11	S	Palm Sunday [☽ 8.27 M.	5 15	6 48	11 26	2 47
12	M	T. R. Williams d. 1871	5 13	6 50	After	3 8
13	Tu		5 11	6 51	2 8	3 25
14	W		5 9	6 53	3 33	3 40
15	Th		5 6	6 54	5 0	3 55
16	F	Good Friday	5 4	6 56	6 30	4 11
17	S	Fargier's Carbon Process pat. 1861.	5 2	6 58	8 5	4 29
18	S	Easter Sunday [○ 6.25 M.	5 0	7 0	9 39	4 52
19	M	Warren de la Rue d. 1889	4 58	7 1	11 7	5 24
20	Tu	J. A. Spencer d. 1878	4 56	7 3	Morn	6 9
21	W	Talbot's Photo.-etch. Proc. pat. 1858	4 54	7 4	0 18	7 10
22	Th		4 52	7 6	1 11	8 26
23	F	☾ 9.48 A.	4 50	7 7	1 47	9 48
24	S	Celsius d. 1744	4 48	7 9	2 12	11 9
25	S	Low Sunday. 'Sun-blinds' pat.	4 46	7 11	2 31	After
26	M	Adam Salomon d. 1881 [1862	4 44	7 13	2 46	1 41
27	Tu	Morse b. 1791	4 42	7 14	2 58	2 53
28	W		4 40	7 16	3 10	4 3
29	Th		4 38	7 17	3 22	5 12
30	F	Col. Stuart Wortley d. 1890	4 36	7 19	3 35	6 23

APRIL.

D. M.	D. W.	MEMORANDA.
1	Th	
2	F	*For* MEETINGS OF SOCIETIES, *see pp.* 548–597.
3	S	
4	S	
5	M	
6	Tu	
7	W	
8	Th	
9	F	
10	S	
11	S	
12	M	
13	Tu	
14	W	
15	Th	
16	F	
17	S	
18	S	
19	M	
20	Tu	
21	W	
22	Th	
23	F	
24	S	
25	S	
26	M	
27	Tu	
28	W	
29	Th	
30	F	

MAY.

D. M.	D. W.	Remarkable Events.	Sun. Rises. H. M.	Sun. Sets. H. M.	Moon. Rises. Morn.	Moon. Sets. After.
1	S	● 8.46 A.	4 34	7 21	3 51	7 34
2	S	2nd Sunday aft. Easter	4 32	7 23	4 10	8 44
3	M		4 30	7 24	4 34	9 51
4	Tu	Senebier b. 1742	4 29	7 26	5 9	10 51
5	W	J. W. Draper b. 1811	4 27	7 27	5 53	11 41
6	Th	Humboldt d. 1859	4 25	7 29	6 51	Morn
7	F		4 23	7 30	7 58	0 19
8	S	Peroxide of H. rec. for rem. of Hypo, '66	4 22	7 32	9 12	0 49
9	S	3rd Sun. after Easter. ☽ 9.37 A.	4 20	7 33	10 29	1 10
10	M	South London Photo. Soc. f. 1859	4 19	7 35	11 47	1 29
11	Tu	Becquerel d. 1891	4 17	7 36	After	1 45
12	W	Sir John Herschel d. 1871	4 15	7 38	2 29	1 59
13	Th	Justus von Liebig b. 1803	4 13	7 39	[illegible] 55	2 14
14	F	Fahrenheit b. 1686	4 12	7 41	5 26	2 30
15	S	[Major C. Russell d. '87. ○ 1.55 A.	4 10	7 42	7 0	2 51
16	S	4th S. aft. Easter. C. Breese d. '75.	4 9	7 44	8 34	3 18
17	M	Association Belge founded, 1874	4 7	7 45	9 56	3 57
18	Tu		4 6	7 47	11 0	4 52
19	W		4 5	7 48	11 43	6 3
20	Th		4 4	7 50	Morn	7 26
21	F	Scheele d. 1786	4 2	7 51	0 14	8 51
22	S		4 1	7 53	0 34	10 13
23	S	Rogation Sunday. B. J. Sayce d.	3 59	7 54	0 52	11 29
24	M	[1895. ☾ 9.35 M.	3 58	7 56	1 5	After
25	Tu		3 57	7 57	1 17	1 54
26	W	H. B. Berkeley d. 1890	3 56	7 58	1 29	3 4
27	Th		3 55	7 59	1 43	4 13
28	F		3 54	8 1	1 58	5 24
29	S	Sir H. Davy d. 1829	3 53	8 2	2 15	6 35
30	S	Sunday after Ascension Day	3 52	8 3	2 38	7 43
31	M	● 0.26 A.	3 51	8 4	3 10	8 45

MAY.

D. M.	D. W.	MEMORANDA.
1	S	*For* MEETINGS OF SOCIETIES, *see pp.* 548–597.
2	S	
3	M	
4	Tu	
5	W	
6	Th	
7	F	
8	S	
9	S	
10	M	
11	Tu	
12	W	
13	Th	
14	F	
15	S	
16	S	
17	M	
18	Tu	
19	W	
20	Th	
21	F	
22	S	
23	S	
24	M	
25	Tu	
26	W	
27	Th	
28	F	
29	S	
30	S	
31	M	

JUNE.

D. M.	D. W.	Remarkable Events.	Sun Rises. H. M.		Sun Sets. H. M.		Moon Rises. Morn.		Moon Sets. After.	
1	Tu		3	50	8	5	3	52	9	38
2	W	Niepce pubsh. his *Heliochromic Pro-*	3	50	8	6	4	45	10	20
3	Th	[*cesses*, 1851	3	49	8	7	5	50	10	52
4	F	Tessié du Mothay d. 1880	3	49	8	8	7	2	11	16
5	S		3	48	8	9	8	17	11	34
6	S	Whit Sunday	3	48	8	10	9	33	11	51
7	M	Fraunhofer d. 1826	3	47	8	11	10	51	Morn	
8	Tu	☽ 7.3 M.	3	47	8	12	After		0	5
9	W		3	46	8	12	1	33	0	19
10	Th		3	46	8	13	2	57	0	34
11	F	Cutting's American Bromide pat.	3	45	8	14	4	27	0	52
12	S	[1853	3	45	8	15	6	0	1	14
13	S	Trinity Sunday	3	44	8	15	7	26	1	47
14	M	Partnership between Daguerre and	3	44	8	16	8	40	2	33
15	Tu	[Niepce, 1837. ○ 9.2 A.	3	44	8	16	9	34	3	36
16	W	Chrysotype and Cyanotype Process	3	44	8	17	10	11	4	57
17	Th	[com. to Royal Society, 1842	3	44	8	17	10	36	6	23
18	F		3	44	8	18	10	56	7	49
19	S	Abbé Laborde d. 1883	3	44	8	18	11	11	9	10
20	S	1st Sunday after Trinity	3	44	8	18	11	24	10	27
21	M	Niepce Memorial uncov. at Chalons,	3	44	8	18	11	36	11	41
22	Tu	[1885. ☾ 11.24 A.	3	44	8	19	11	49	After	
23	W		3	45	8	19	Morn		2	2
24	Th	Hardwich d. 1890	3	45	8	19	0	3	3	12
25	F	[b. 1839	3	46	8	19	0	20	4	23
26	S	W. B. Woodbury b. 1834. Liesegang	3	46	8	19	0	41	5	32
27	S	2nd S. aft. Trinity. Herr Wothly	3	47	8	19	1	9	6	37
28	M	[d. 1873. G. Price d. 1870	3	47	8	19	1	48	7	34
29	Tu	Ferrous-oxalate Developer pub. 1877	3	48	8	18	2	38	8	19
30	W	● 2.55 M.	3	48	8	18	3	40	8	54

JUNE.

D. M.	D. W.	MEMORANDA.
1	Tu	For MEETINGS OF SOCIETIES, see pp. 548–597.
2	W	
3	Th	
4	F	
5	S	
6	S	
7	M	
8	Tu	
9	W	
10	Th	
11	F	
12	S	
13	S	
14	M	
15	Tu	
16	W	
17	Th	
18	F	
19	S	
20	S	
21	M	
22	Tu	
23	W	
24	Th	
25	F	
26	S	
27	S	
28	M	
29	Tu	
30	W	

JULY.

D. M.	D. W.	Remarkable Events.		Sun Rises. H. M.	Sun Sets. H. M.	Moon Rises. Morn.	Moon Sets. After.
1	Th			3 49	8 18	4 51	9 21
2	F			3 49	8 17	6 6	9 42
3	S			3 50	8 17	7 24	9 58
4	S	3rd Sunday after Trinity		3 51	8 17	8 41	10 12
5	M	Nicephore Niepce d. 1833		3 52	8 17	9 59	10 25
6	Tu			3 53	8 16	11 19	10 39
7	W		☽ 1.32 A.	3 54	8 15	After	10 56
8	Th			3 54	8 14	2 6	11 16
9	F			3 55	8 14	3 34	11 43
10	S	Daguerre d. 1851		3 56	8 13	5 1	Morn
11	S	4th Sunday after Trinity		3 57	8 12	6 20	0 21
12	M	Wedgwood b. 1730		3 58	8 11	7 22	1 16
13	Tu	Abbé Moigno d. 1884		4 0	8 11	8 5	2 27
14	W	Dumas b. 1800	○ 4.52 M.	4 1	8 10	8 36	3 52
15	Th			4 2	8 9	8 58	5 19
16	F	Claudet b. 1797		4 3	8 8	9 16	6 44
17	S			4 4	8 7	9 29	8 5
18	S	5th Sunday after Trinity.	V. M.	4 5	8 5	9 42	9 21
19	M	[Griswold (Inv. Ferrotype) d. 1872		4 7	8 4	9 55	10 35
20	Tu	Collodion Pos. Process pub. 1852		4 8	8 3	10 8	11 47
21	W	Regnault b. 1810	☾ 3.8 A.	4 9	8 2	10 25	After
22	Th			4 10	8 1	10 44	2 10
23	F			4 12	8 0	11 9	3 20
24	S	Captain Abney b. 1843		4 13	7 58	11 43	4 26
25	S	6th Sunday after Trinity		4 15	7 57	Morn	5 26
26	M	Niepce de St. Victor b. 1806		4 16	7 55	0 30	6 16
27	Tu			4 18	7 54	1 28	6 55
28	W			4 19	7 52	2 36	7 25
29	Th	Secchi b. 1818	● 3.58 A.	4 21	7 51	3 51	7 47
30	F			4 22	7 49	5 10	8 4
31	S	Wohler b. 1800		4 24	7 47	6 28	8 20

JULY.

D. M.	D. W.	MEMORANDA.
1	Th	*For* Meetings of Societies, *see pp.* 548–597.
2	F	
3	S	
4	S	
5	M	
6	Tu	
7	W	
8	Th	
9	F	
10	S	
11	S	
12	M	
13	Tu	
14	W	
15	Th	
16	F	
17	S	
18	S	
19	M	
20	Tu	
21	W	
22	Th	
23	F	
24	S	
25	S	
26	M	
27	Tu	
28	W	
29	Th	
30	F	
31	S	

AUGUST.

D. M.	D. W.	Remarkable Events.	Sun. Rises. H. M.	Sun. Sets. H. M.	Moon. Rises. Morn.	Moon. Sets. After.
1	S	7th Sunday after Trinity	4 25	7 45	7 48	8 34
2	M	Stromeyer b. 1776	4 26	7 44	9 7	8 48
3	Tu	Mungo Ponton d. 1880	4 28	7 43	10 29	9 4
4	W		4 29	7 41	11 53	9 22
5	Th	Wollaston b. 1766 ☽ 6.25 A.	4 31	7 40	After	9 45
6	F		4 32	7 38	2 46	10 18
7	S	Berzelius d. 1848	4 34	7 36	4 6	11 6
8	S	8th Sunday after Trinity. Roger	4 35	7 34	5 12	Morn
9	M	[Fenton d. 1869	4 37	7 32	6 2	0 9
10	Tu		4 38	7 30	6 36	1 26
11	W		4 40	7 28	7 1	2 52
12	Th	○ 2.23 A.	4 42	7 26	7 20	4 17
13	F	Prof. Stokes b. 1819	4 44	7 25	7 35	5 39
14	S	Daguerreotype Process pat. 1839	4 45	7 23	7 49	6 59
15	S	9th Sunday after Trinity	4 47	7 21	8 2	8 13
16	M	Lavoisier b. 1743	4 48	7 19	8 16	9 28
17	Tu		4 50	7 17	8 30	10 40
18	W	Dr. Woodward (photo-microscopist)	4 51	7 15	8 48	11 52
19	Th	[d. 1884	4 53	7 13	9 10	After
20	F	☾ 8.29 M.	4 54	7 11	9 41	2 12
21	S	Chevreul b. 1786	4 56	7 9	10 22	3 14
22	S	10th Sunday after Trinity	4 58	7 6	11 15	4 8
23	M		5 0	7 4	Morn	4 51
24	Tu	Cutting (Introd. of Ambrotype) d. '67	5 1	7 2	0 19	5 26
25	W	Faraday d. 1867	5 3	7 0	1 31	5 51
26	Th	Paul Pretsch d. 1873. Daguerre Mem.	5 4	6 58	2 48	6 10
27	F	[uncovered, 1883	5 6	6 56	4 8	6 27
28	S	● 3.29 M.	5 8	6 54	5 29	6 42
29	S	11th S. aft. Trinity.	5 9	6 52	6 49	6 56
30	M	Oliver Sarony d. 1879	5 10	6 49	8 13	7 11
31	Tu	Helmholtz b. 1821	5 12	6 47	9 37	7 29

AUGUST.

D. M.	D. W.	MEMORANDA.
1	S	*For* MEETINGS OF SOCIETIES, *see pp.* 548–597.
2	M	
3	Tu	
4	W	
5	Th	
6	F	
7	S	
8	S	
9	M	
10	Tu	
11	W	
12	Th	
13	F	
14	S	
15	S	
16	M	
17	Tu	
18	W	
19	Th	
20	F	
21	S	
22	S	
23	M	
24	Tu	
25	W	
26	Th	
27	F	
28	S	
29	S	
30	M	
31	Tu	

SEPTEMBER.

D. M.	D. W.	Remarkable Events.	Sun Rises. H. M.	Sun Sets. H. M.	Moon Rises. Morn.	Moon Sets. After.
1	W	Norris's Dry-plate Process pat. 1856	5 15	6 45	11 5	7 51
2	Th		5 16	6 43	After	8 21
3	F	☽ 11.13 A.	5 17	6 41	1 55	9 3
4	S	Woodbury d. 1885	5 18	6 38	3 5	10 0
5	S	12th Sun. after Trinity. Panta-	5 20	6 36	3 59	11 12
6	M	[scopic Camera pat. 1862	5 21	6 34	4 38	Morn
7	Tu	Poitevin Memorial inaugurated, '85.	5 23	6 32	5 5	0 34
8	W	Gel.-bro. Pro. pub. by Maddox, 1871	5 25	6 29	5 25	1 57
9	Th	Col.-bro. Pro. pub. 1864	5 27	6 27	5 42	3 19
10	F		5 28	6 24	5 56	4 38
11	S	○ 2.12 M.	5 30	6 22	6 8	5 54
12	S	13th Sunday after Trinity	5 31	6 20	6 21	7 8
13	M		5 33	6 18	6 36	8 21
14	Tu	Humboldt b. 1769	5 34	6 15	6 53	9 32
15	W	Petzval d. 1891	5 36	6 13	7 14	10 47
16	Th		5 37	6 11	7 41	11 56
17	F	Fox Talbot d. 1877	5 39	6 9	8 18	After
18	S	Leon Foucault b. 1819 [☾ 2.51 M.	5 41	6 6	9 5	1 59
19	S	14th S. aft. Trin. T. Grubb d. '78.	5 43	6 4	10 4	2 46
20	M	Talbot's Discovery of Develop. 1840	5 44	6 1	11 12	3 22
21	Tu	Stas b. 1813	5 46	5 59	Morn	3 51
22	W	Faraday b. 1791. Thos. Sutton b. '19	5 47	5 57	0 26	4 12
23	Th	Woodbury Process pat. 1864	5 49	5 55	1 43	4 30
24	F	J. G. Tunny d. 1887	5 50	5 52	3 3	4 47
25	S	Dr. Van Monckhoven b. 1834, d. 1882	5 52	5 50	4 24	5 1
26	S	15th Sun. after Trinity. ● 1.46 A.	5 54	5 48	5 47	5 17
27	M	Kolbe b. 1818	5 56	5 46	7 13	5 34
28	Tu		5 57	5 43	8 42	5 55
29	W		5 59	5 41	10 12	6 24
30	Th	Balard (Discoverer of Bromine) b. [1802	6 0	5 38	11 40	7 2

SEPTEMBER.

D. M.	D. W.	MEMORANDA.
1	W	*For* MEETINGS OF SOCIETIES, *see pp.* 548–597.
2	Th	
3	F	
4	S	
5	S	
6	M	
7	Tu	
8	W	
9	Th	
10	F	
11	S	
12	S	
13	M	
14	Tu	
15	W	
16	Th	
17	F	
18	S	
19	S	
20	M	
21	Tu	
22	W	
23	Th	
24	F	
25	S	
26	S	
27	M	
28	Tu	
29	W	
30	Th	

OCTOBER.

D. M.	D. W.	Remarkable Events.	Sun. Rises. H. M.	Sun. Sets. H. M.	Moon. Rises. After.	Moon. Sets. After.
1	F		6 2	5 36	0 56	7 56
2	S	Arago d. 1853	6 3	5 34	1 55	9 4
3	S	16th Sun. after Trinity. ☽ 5.32 M.	6 5	5 32	2 38	10 23
4	M		6 7	5 29	3 8	11 45
5	Tu		6 9	5 27	3 30	Morn
6	W		6 10	5 25	3 48	1 6
7	Th		6 12	5 23	4 3	2 24
8	F		6 13	5 20	4 17	3 39
9	S		6 15	5 18	4 29	4 53
10	S	17th Sun. after Trinity. ○ 4.42 A.	6 17	5 16	4 43	6 5
11	M	H. T. Anthony d. 1884	6 19	5 14	5 0	7 18
12	Tu	Gmelin b. 1792	6 20	5 12	5 19	8 30
13	W		6 22	5 10	5 43	9 41
14	Th		6 24	5 7	6 17	10 48
15	F		6 26	5 5	7 0	11 49
16	S	[1757. Robert Hunt d. 1887	6 27	5 3	7 53	After
17	S	18th Sun. aft. Trin. Reaumur d.	6 29	5 1	8 57	1 19
18	M	Schonbein b. 1799. Wheatstone d.	6 31	4 59	10 8	1 49
19	Tu	[1875. ☾ 9.9 A.	6 33	4 57	11 21	2 13
20	W		6 34	4 55	Morn	2 33
21	Th		6 36	4 53	0 38	2 50
22	F		6 38	4 51	1 56	3 5
23	S		6 40	4 49	3 16	3 20
24	S	19th Sunday after Trinity	6 41	4 47	4 40	3 37
25	M	Vernon Heath d. 1895 ● 11.28 A.	6 43	4 45	6 8	3 56
26	Tu		6 45	4 43	7 40	4 21
27	W		6 47	4 41	9 12	4 56
28	Th	Col.-chlo. of Silver Process pub. 1864	6 48	4 39	10 36	5 46
29	F	Talbot Photo-eng. Process pat. 1852	6 50	4 37	11 46	6 51
30	S		6 52	4 35	After	8 9
31	S	20th Sunday after Trinity	6 54	4 33	1 10	9 32

OCTOBER.

D. M.	D. W.	MEMORANDA.
1	F	*For* MEETINGS OF SOCIETIES, *see pp.* 548–597.
2	S	
3	S	
4	M	
5	Tu	
6	W	
7	Th	
8	F	
9	S	
10	S	
11	M	
12	Tu	
13	W	
14	Th	
15	F	
16	S	
17	S	
18	M	
19	Tu	
20	W	
21	Th	
22	F	
23	S	
24	S	
25	M	
26	Tu	
27	W	
28	Th	
29	F	
30	S	
31	S	

NOVEMBER.

D. M.	D. W.	Remarkable Events.	Sun Rises H. M.	Sun Sets H. M.	Moon Rises After.	Moon Sets After.
1	M	☽ 2.37 A.	6 55	4 31	1 36	10 55
2	Tu		6 57	4 29	1 55	Morn
3	W		6 59	4 28	2 10	0 14
4	Th		7 1	4 26	2 24	1 30
5	F		7 3	4 24	2 36	2 43
6	S	Senefelder b. 1771 [mond b. 1818	7 4	4 22	2 50	3 55
7	S	21st S. aft. Trinity. Dubois Ray-	7 6	4 21	3 6	5 6
8	M	J. Traill Taylor d. 1895	7 8	4 19	3 25	6 18
9	Tu	Pretsch's Photo-engrav. Process pat.	7 10	4 18	3 48	7 29
10	W	Laroche d. 1886 [1854. ○ 9 50 M.	7 11	4 16	4 17	8 36
11	Th	Willis's Aniline Process pat. 1864	7 13	4 15	4 57	9 40
12	F		7 15	4 13	5 48	10 33
13	S		7 17	4 12	6 51	11 16
14	S	22nd Sunday after Trinity	7 18	4 10	7 55	11 50
15	M		7 20	4 9	9 6	After
16	Tu	Lavater d. 1741	7 22	4 7	10 20	0 37
17	W	☾ 2.2 A.	7 24	4 6	11 35	0 53
18	Th	Daguerre b. 1787	7 25	4 5	Morn	1 8
19	F		7 27	4 4	0 52	1 23
20	S	Prof. Draper d. 1882	7 28	4 2	2 10	1 39
21	S	23rd Sunday after Trinity	7 30	4 1	3 34	1 56
22	M	Schlippe b. 1749	7 32	4 0	5 3	2 18
23	Tu	Harrison (Inv. of Globe Lens) d. 1864	7 34	3 59	6 35	2 48
24	W	● 9.20 M.	7 35	3 58	8 4	3 31
25	Th		7 37	3 57	9 23	4 30
26	F		7 38	3 56	10 24	5 45
27	S	Celsius b. 1701	7 40	3 56	11 7	7 11
28	S	1st Sunday in Advent. Sutton's	7 41	3 55	11 36	8 37
29	M	[Panoramic Camera pat. 1859	7 43	3 54	11 59	10 0
30	Tu		7 44	3 53	After	11 19

NOVEMBER.

D. M.	D. W.	MEMORANDA.
1	M	
2	Tu	*For* MEETINGS OF SOCIETIES, *see pp.* 548–597.
3	W	
4	Th	
5	F	
6	S	
7	S	
8	M	
9	Tu	
10	W	
11	Th	
12	F	
13	S	
14	S	
15	M	
16	Tu	
17	W	
18	Th	
19	F	
20	S	
21	S	
22	M	
23	Tu	
24	W	
25	Th	
26	F	
27	S	
28	S	
29	M	
30	Tu	

DECEMBER.

D. M.	D. W.	Remarkable Events.		Sun Rises. H. M.	Sun Sets. H. M.	Moon Rises. After.	Moon Sets. Morn.
1	W	Klaproth b. 1743	☽ 3.15 M.	7 46	3 53	0 30	Morn
2	Th			7 47	3 52	0 44	0 32
3	F			7 49	3 52	0 58	1 46
4	S	Galvani d. 1798		7 50	3 51	1 13	2 57
5	S	2nd Sunday in Advent		7 51	3 51	1 30	4 8
6	M	Obernetter's Chromo-photo. pat. 1864		7 52	3 50	1 52	5 19
7	Tu			7 54	3 50	2 19	6 27
8	W			7 55	3 49	2 56	7 31
9	Th	Scheele b. 1742. Duc de Luynes d.		7 56	3 49	3 44	8 28
10	F	[1867.	○ 4.54 M.	7 57	3 49	4 41	9 15
11	S	Sir D. Brewster b. 1781 [d. 1870		7 58	3 49	5 46	9 52
12	S	3rd S. in Adv. Rev. J. B. Reade		7 59	3 49	6 55	10 21
13	M	First Photo-enam. Proc. pat. 1854		8 0	3 49	8 9	10 42
14	Tu	E. Anthony d. 1888		8 1	3 49	9 23	10 59
15	W	[1870		8 2	3 49	10 37	11 14
16	Th	H. Greenwood d. 1884. T. Ross d.		8 2	3 49	11 52	11 29
17	F	Sir Humphry Davy b. 1778.	☾ 4.22 M.	8 3	3 49	Morn	11 43
18	S			8 4	3 50	1 11	11 59
19	S	4th Sunday in Advent. Mawson		8 5	3 50	2 34	After
20	M	[k. 1867		8 5	3 50	4 0	0 42
21	Tu			8 6	3 50	5 29	1 17
22	W	Wollaston d. 1828		8 6	3 51	6 53	2 7
23	Th		● 7.55 A.	8 7	3 52	8 4	3 14
24	F			8 7	3 53	8 57	4 37
25	S	Christmas Day. Sir I. Newton b. 1642		8 8	3 53	9 34	6 6
26	S	1st Sunday after Christmas		8 8	3 54	10 0	7 34
27	M			8 8	3 55	10 19	8 58
28	Tu	J. T. Goddard d. '66		8 8	3 56	10 35	10 16
29	W			8 8	3 56	10 50	11 32
30	Th	J. H. Dallmeyer d. 1883	☽ 7.27 A.	8 8	3 57	11 4	Morn
31	F	A. Braun d. 1877		8 9	3 58	11 18	0 45

DECEMBER.

D. M.	D. W.	MEMORANDA.
1	W	*For* MEETINGS OF SOCIETIES, *see pp.* 548–597.
2	Th	
3	F	
4	S	
5	S	
6	M	
7	Tu	
8	W	
9	Th	
10	F	
11	S	
12	S	
13	M	
14	Tu	
15	W	
16	Th	
17	F	
18	S	
19	S	
20	M	
21	Tu	
22	W	
23	Th	
24	F	
25	S	
26	S	
27	M	
28	Tu	
29	W	
30	Th	
31	F	

PHOTOGRAPHIC SOCIETIES OF THE UNITED KINGDOM.

Aberdeenshire Amateur Photographic Society.—(ESTABLISHED 1891.)—Meetings are held at 26 Broad Street, Aberdeen. *President*—Alexander Mackilligan. *Vice-Presidents*—William Ross and W. T. Borthwick. *Committee*—George Grant, J. S. Anderson, D. Coutts, James Main, James Glass, James Davidson, John Watson. *Treasurer*—William Thomson. *Secretary*—Lewis G. Jamieson, 119 Union Grove, Aberdeen.

Accrington and District Camera Club.—(ESTABLISHED 1892.)—*President*—Dr. Clayton. *Vice-Presidents*—A. Barnes, W. J. Cheney, W. Clayton, T. Stanley. *Committee*—J. Barnes, F. Bradshaw, A. Greenwood, J. A. Hanson, J. R. Hitchon, W. Kenyon. *Secretary and Treasurer*—Isaac Hanson, Rothwell Heights, Accrington.

Affiliation of Photographic Societies.—(ESTABLISHED 1892.)—Meetings held at 12 Hanover Square, London, W. *Chairman*—W. Thomas. *Committee*—Consists of two Delegates from each Society, with three from the Royal Photographic Society. *Treasurer*—George Scamell. *Secretary*—R. Child Bayley, 12 Hanover Square, London, W.

Aintree Photographic Society.—(ESTABLISHED 1894.)—Meetings are held at the Institute, Aintree. *President*—C. H. Adkins. *Vice-Presidents*—J. R. Jones and W. B. Hellon. *Council*—R. M Owen, John Watson, W. Lockier, John Harris, G. Ashley, C. F. Inston, John Wilson, Dr. Fleetwood. *Treasurer*—W. H. Lloyd. *Secretary*—D. J. Neill, 8 Chelsea Road, Aintree. *Assistant Secretary*—E. P. Heron.

Altrincham Photographic Society.—Meetings held at the Technical School, Altrincham. *President*—J. Taylor Hughes. *Vice-President*—F. W. Parrott. *Committee*—Messrs. Gibb, Jones, and Wright. *Hon Treasurer*—J. Drinkwater. *Hon. Secretary*—C. P. Babin, Clifton Avenue, Stockport Road, Altrincham.

Amateur Photographic Association.—(ESTABLISHED 1869, REORGANISED 1896.)—Offices, 182 Regent Street, W. *President*—H.R.H. the Prince of Wales. *Vice-Presidents*—H.R.H. the Duke of Cambridge, K.G., H.H. the Duke of Teck, G.C.B., &c., His Grace the Archbishop of York, His Grace the Duke of Newcastle, the Right Hon. the Earl of Rosse, F.R.S., the Right Hon. the Earl of Warwick, General the Right Hon. the Lord de Ros, James Glaisher, F.R.S., F.R.A.S., &c. *Council*—The Right Hon. the Viscount Maitland, Sir J. Whittaker Ellis, Bart., M.P., Charles Stephens, M.A., Oxon, Walter Wood, F.R.G.S., W. S. Hobson, Robert O. Milne. *Hon. Secretary*—Henry Van der Weyde, 182 Regent Street, W.

Amateur Photographic Field Club.—(ESTABLISHED 1860.)—*President*—F. de P. Cembrano, jun. *Hon. Secretary* (*pro tem.*)—F. de P. Cembrano, jun., 10 Cambridge Gardens, Richmond, Surrey.

Amateur Photographic Research Camera Club.—(ESTABLISHED 1894.)—Meetings held in members' houses by turn. *President*—Sidney Greer. *Vice-President*—James Collins. *Committee*—President, Vice-President, Treasurer, Secretary. *Treasurer*—Robert B. Gardner. *Secretary*—John C. W. Davidson, Windsor Park, Belfast.

Arbroath Amateur Photographic Society.—(ESTABLISHED 1890.)—Meetings held at the Y.M.C.A. Rooms. *President*—George G. Dalgarno. *Vice-President*—Robert Moodie. *Committee*—George K. Reid, Robert Davidson, John M'Lean, David Young. *Treasurer*—George K. Reid. *Secretary*—James Hood, 94 High Street.

Ashton-under-Lyne Photographic Society.—(ESTABLISHED 1891.)—Meetings held at Henry Square, Ashton-under-Lyne. *President*—Dr. Alexander Hamilton. *Vice-Presidents*—Major Bradley, Abel Buckley, J.P., T. Cheyne, T. Glazebrook, John W. Kenworthy, J.P., Charles Lord, Charles E. Redfern, J.P., John Wilson, J.P. *Committee*—John Andrew, William C. Brown, William Greenwood, J. Hutchinson, T. F. Kershaw, T. A. Nield, Charles Taylor, S. Woolley. *Auditors*—James Dunkerley and J. W. Turnbull. *Curatrix*—Mrs. Lowe. *Hon. Librarian*—Samuel A. Platt. *Hon. Treasurer*—Walter Leigh. *Hon. Secretary*—Robert T. Marsland, 24 Park Parade, Ashton-under-Lyne.

Aston Natural History and Photographic Society.—(ESTABLISHED 1892.)—Meetings held at Burlington Hall, High Street, Aston, on Thursdays, at Eight p.m. *President*—Hill Norris, M.D., J.P. *Vice-Presidents*—Councillor S. Fisher and W. Tylar. *Committee*—G. Priddin, A. Fidoe, A. Twigg, J. Sands, A. C. Townsend, F. Wallis, F. Casson, J. Brookes. *Treasurer*—J. W. Johnson. *Secretary*—Frederick W. Pilditch, 185 Bevington Road, Aston, Birmingham.

Banbury and District Photographic Society.—(ESTABLISHED 1894.)—Meetings held at the Municipal Schools, Banbury. *Committee*—S. H. Beale, A. J. Brummitt, T. J. H. Blinkhorn, N. G. Ffrench, T. E. Orchard, W. Potts, H. Stanley, W. E. Wood. *Treasurer*—W. R. Sansbury. *Secretary*—J. Davenport, Brookfield, Banbury, Oxon.

Barnsley and District Photographic Society.—(ESTABLISHED 1893.)—Meetings held at the Arcade Schools, George Yard, Barnsley. *President*—O. de Mirimonde. *Vice-Presidents*—A. R. Tomlin and T. Parkes, M.A. *Committee*—Messrs. Guest, Haigh, Coles, W. Taylor, J. G. Taylor, and Ogden. *Secretary and Treasurer*—Charles Robert Barham, Bond Road, Barnsley.

Barrow-in-Furness Naturalists' Field Club (Photographic Section).—(ESTABLISHED 1890.)—Meetings held at Cambridge Hall. *President*—W. Dunlop. *Vice-Presidents*—J. Timms and C. J. Weston. *Committee*—Messrs. Dunlop, Timms, Walton, Weston, Redhead, Bailey, Gaine, and Huddleston. *Treasurer*—F. W. Walton. *Secretary*—T. Huddleston 285 Rawlinson Street, Barrow-in-Furness.

Bath Photographic Society.—(ESTABLISHED 1888.)—Meetings held at the Royal Literary and Scientific Institution. *President*—George F. Powell. *Vice-Presidents*—E. Lambert and E. J. Appleby. *Committee*—Austin J. King, Aug. F. Perren, Dr. Norman, Rev. E. A. Purvis, Colonel Sealy, the Very Rev. Monsignor Williams, D. Prout Williams, W. Pumphrey. *Curator*—Aug. F. Perren. *Librarian*—E. Lambert. *Hon. Secretary and Treasurer*—W. Middleton Ashman, 12A Old Bond Street, Bath.

Batley and District Photographic Society.—(ESTABLISHED 1894.)—Meetings are held at the Technical School. *President*—Percy Sheard. *Vice-Presidents*—T. T. Tubb and C. Naylor. *Committee*—A. S. Fox, Dr. Woods, R. Hall, H. Buckley, W. T. Ineson, A. Brearley, J.P. *Treasurer*—Arthur Bagshaw. *Secretaries*—Dr. H. Keighley, West House, Batley, and T. H. Fox, Grosvenor House, Batley.

Beverley Photographic and Sketching Society.—(ESTABLISHED 1893.)—Meetings held in the Club Room, Butcher Row. *President*—J. J. Harrison, J.P. *Vice-Presidents*—Rev. F. J. Hall, J. A. Ridgway, Captain Forrest, Dr. Croke, Rev. Canon Nolloth, D.D., Douglas Joy, Dr. Appleton, J.P., E. R. B. Hall-Watt, J.P. *Council*—W. Barnard, G. Dawson, T. B. Burton, J. C. Cook, W. H. Kirby, G. W. Richardson. *Librarian*—H. Mann. *Secretaries and Treasurers*—T. J. Morley and J. A. Pickering, Toll Gavel, Beverley, Yorkshire.

Birkenhead Photographic Association.—(ESTABLISHED 1894.)—Meetings are held at the Y.M.C.A., Birkenhead. *President*—William Shillinglaw. *Vice-Presidents*—T. F. Roberts and Edward Newall. *Committee*—Robert J. Walker, J. Smith, — Manley, O. Cooper, — Rae, J. W. Walton, W. H. Ralston, W. H. Barlow. *Treasurer*—James Walker. *Secretary*—Richard J. Russell, 25 Grange Mount, Birkenhead.

Birmingham Natural History and Philosophical Society.—(ESTABLISHED 1858.)—Meetings held at Mason College, Birmingham. *President*—J. Landon, F.G.S. *Hon. Secretaries*—W. P. Marshall, M.I.C.E., and W. Boulton, A.R.C.S., F.G.S. *Assistant Secretary and Curator*—Samuel P. Bolton.

Birmingham Photographic Society.—(ESTABLISHED 1885.)—Meetings held at Exchange Buildings, Stephenson Place, Birmingham. *President*—Sir J. Benjamin Stone, M.P., J.P., F.G.S., F.L.S., F.R.G.S., F.R.A.S. *Vice-Presidents*—G. F. Lyndon, J.P., W. Jones, J. H. Pickard, G. A. Thomason. *Council*—W. Bateman, C. H. Barnsley, R. C. Cartwright, P. T. Deakin, W. T. Greatbatch, F. Lewis, A. R. Longmore, E. Underwood, T. Taylor. *Librarian*—W. S. Horton. *Treasurer*—F. J. Penn. *Secretary*—C. J. Fowler, Court Mount, Erdington, Birmingham.

Blairgowrie and District Photographic Association.—(ESTABLISHED 1894.)—Meetings held at the Club Room, Brown Street, Blairgowrie. *President*—Alexander Geekie. *Vice-Presidents*—Miss White and J. B. Maclachlan. *Committee*—Messrs. Petrie, Murray, Clyde, Grockath, and Soutar. *Treasurer*—James Richardson. *Secretary*—Thomas C. Gorrie, Beechbank, Rattray, Blairgowrie.

Bolton Photographic Society.—(ESTABLISHED 1879.)—Meetings are held at the Society's Rooms, Rushton Street, Bolton. *President*—J. R. Bridson, J.P., &c. *Vice-Presidents*—B. H. Abbatt, W. Banks, R. Harwood, W. Knowles, J. Boothroyd, J. P. Haslam, J.P., R. Leigh, J. Taylor, C. K. Dalton. *Treasurer*—C. K. Dalton. *Secretary*—T. H. Heyes, 150 Deansgate, Bolton.

Bootle Photographic Society.—(ESTABLISHED 1894.)—Meetings are held at 188 Strand Road, Bootle. *President*—W. R. Brewster. *Vice-Presidents*—T. Pinnington, E. T. Cockerham, G. Y. Tickle, J.P., Captain Gibthorpe. *Council*—R. C. Bond, J. Parke, C. St. C. Crawley, H. S. Trant, H. B. Taylor, H. B. Taylor, jun., E. J. McHarg, H. G. Page, J. S. Chadwick. *Treasurer*—W. T. Wright. *Secretary*—F. W. Knowles, 311 Stanley Road, Bootle, Liverpool. *Assistant Secretary*—A. B. Charters, 20 Green Lane, Seaforth.

Borough Polytechnic Photographic Society.—(ESTABLISHED 1895.)—Meetings held at 103 Borough Road, S.E. *President*—Edric Bayley, M.A., L.C.C. *Vice-Presidents*—Rev. A. W. Jephson, M.A., C. J. Whittuck Rabbits, J.P., Walter A. Wigram. *Chairman*—Alfred Bedding. *Committee*—A. H. Boyce, A. J. Bullock, T. F. Bunce, Horace Gyles, M. J. Lindsey, W. Oubridge, E. C. Toms. *Librarian and Curator*—W. J. M. Nunn. *Treasurer*—A. W. Lovell. *Secretary*—P. C. Cornford, 103 Borough Road, London, S.E.

Bournemouth Photographic Society.—(ESTABLISHED 1890, REORGANISED 1895.)—Meetings held at Athenæum Chambers, Town Hall Avenue, Albert Road. *President*—Dr. Hyla Greves. *Vice-Presidents*—J. W. Bennett and Rev. H. Lee. *Committee*—A. Youngman, E. Harrison, Robert Toop, A. Harris, J. H. Stanley, G. F. Scott. *Treasurer*—William Jones. *Secretary*—Ernest Greenleaves, Priory Mansions, Bath Road, Bournemouth.

Bradford Photographic Society.—(ESTABLISHED 1894.)—Meetings held at Unity Rooms, Sunbridge Road. *President*—Alexander Keighley. *Vice-Presidents*—A. P. Rendell, Walter Booth, F. J. R. Sutcliffe. *Committee*—F. Nicholson, Rev. W. H. Eastlake, G. Swain, S. Hill, G. Thistlethwaite, H. Cousen, W. A. Bell, P. E. Newstead, W. J. Gray, H. Akam. *Hon. Treasurer*—W. C. Ramshaw. *Hon. Secretary*—P. Wilkinson, 31 Thornton Road, Bradford.

Brechin Photographic Association.—(ESTABLISHED 1888.)—Meetings held at Park Road. *Hon. President*—William Shaw Adamson. *Vice-Presidents*—James D. Ross and Robert W. Duke. *Committee*—John Cuthbert, James C. Middleton, David Wilson. *Curator*—David B. Robertson. *Treasurer*—John E. Small. *Secretary*—Alexander Watson, 75 River Street, Brechin, N.B.

Brighouse Photographic Society.—(ESTABLISHED 1894.)—Meetings held at the Town Hall. *President*—Dr. George A. Farrer. *Vice-Presidents*—George Hepworth, A. H. Ormerod, J. Wood. *Committee*—F. M. Cardwell, H. P. Metcalf, S. Ormerod, T. H. Wood, H. Blackburn. *Treasurer*—E. Sugden. *Secretary*—J. H. Georgeson, Huddersfield Road, Brighouse.

Brighton and Sussex Natural History and Philosophical Society (Photographic Section).—(ESTABLISHED 1892.)—Meetings are held at the Free Library and Museum, Church Street, Brighton. *President*—J. P. Slingsby Roberts. *Vice-Presidents*—Sir Joseph Ewart, M.D., Rev. H. G. Day, M.A., Arthur Newsholme, M.D., Douglas E. Caush, L.D.S., George De Paris. *Chairman (Photographic Section)*—W. Clarkson Wallis. *Committee*—Walker Harrison, D.M.D., George Foxall, D. E. Caush, L.D.S., W. H. Payne, C. B. Stoner, D.D.S., W. W. Mitchell, E. Elgee, G. F. Attree. *Hon. Treasurer*—Surgeon-General E. McKellar, M.D., J.P. *Secretary*—R. Chappell Ryan, 43 Compton Avenue, Brighton.

Brighton Photographic Society.—(ESTABLISHED 1895.)—Meetings held at the Brighton Town Hall. *President*—H. Spencer Bridge. *Vice President*—H. G. Caithness. *Secretary and Treasurer*—E. Burnham, 52 Gardner Street, Brighton.

Bristol and West of England Amateur Photographic Association.—(ESTABLISHED 1866.)—Meetings are held at the Literary and Philosophic Club, Berkeley Square, Bristol. *President*—H. A. Hood Daniel. *Vice-Presidents*—Colonel Playfair and Edward Brightman. *Council*—F. B. Bond, W. C. Hemmons, Sidney J. Hill, Walter Norgrove, John Phillips, and Officers. *Treasurer*—W. Moline. *Secretaries*—Edward Brightman, Lyndale, Redland Road, and Martyn Lavington, 5 The Avenue, Redland, Bristol.

British Association for the Advancement of Science.—(ESTABLISHED 1831.)—The meeting in 1897 will be held at Toronto on August 18. *President Elect*—Sir John Evans, K.C.B., Treas. R.S. *President*—Sir Joseph Lister, Bart., Pres. R.S. *General Treasurer*—Prof. Arthur W. Rücker, M.A., F.R.S. *General Secretaries*—Captain Sir Douglas Galton, K.C.B., D.C.L., LL.D., F.R.S., F.G.S., 12 Chester Street, London, S.W., and A. G. Vernon Harcourt, M.A., D.C.L., LL.D., F.R.S., F.C.S., Cowley Grange, Oxford. *Assistant General Secretary*—G. Griffith, M.A., College Road, Harrow, Middlesex.

Brixton and Clapham Camera Club.—(ESTABLISHED 1889.)—Affiliated to the Royal Photographic Society. Meetings are held at Brixton Hall, Acre Lane, London, S.W. *President*—J. W. Coade. *Vice-Presidents*—W. Fraser, A. Horsley Hinton, W. Thomas. *Council*—C. F. Archer, M. Atkinson, J. Gunston, R. G. F. Kidson, J. Price, G. W. Welham. *Secretary*—Frederick W. Levett, 116 Loughborough Park, Brixton, S.W.

Bromsgrove School Photographic Society.—(ESTABLISHED 1893.)—Meetings held at King Edward's School, Bromsgrove. *President*—P. K. Tollit, M.A. *Treasurer*—T. S. Stokes. *Secretary*—H. E. Holmes, The School, Bromsgrove, Worcestershire.

Bury Photographic and Arts Club.—(ESTABLISHED 1882.)—Meetings held at 14 Market Street, Bury. *President*—Roger Wood. *Vice-Presidents*—E. W. Mellor, W. Booth, R. Grundy, jun., A. F. Stanesby. *Council*—J. Hamer, E. Taylor, G. T. Brierley, P. Stock, G. Richardson. *Treasurer*—J. W. Handley. *Hon. Secretaries*—Walter Mellor, Haymarket Street, Bury, and T. Talbot.

Burton-on-Trent Natural History and Archæological Society (Photographic Section).—Meetings held at 30 High Street, Burton-on-Trent. *President*—R. Churchill. *Secretary*—H. H. Port, 103 Scalpcliffe Road, Burton-on-Trent.

Camera & Company Postal Photographic Circulating Club.—(ESTABLISHED 1891.)—*Secretary*—Albert O. Forrest, 14 Market Street, Pontypridd.

Camera Club.—(ESTABLISHED 1885.)—Meetings are held at 28 Charing Cross Road. *President*—Captain W. de W. Abney, C.B. *Vice-Chairman*—F. Machell Smith. *Committee*—W. A. Greene, E. Ferrero, H. E. Armstrong, W. Clarke, R. W. Cox, G. Davison, A. Deed, J. C. L. Knight-Bruce, J. J. Stuart-Edwards, Rev. N. R. Fitzpatrick, Colonel R. Holbeche, H. H. P. Powles, J. F. Roberts, Colonel R. Stewart, R. W. Craigie. *Secretary*—F. Seyton Scott, Camera Club.

Cardiff Photographic Society.—(ESTABLISHED 1886.)—Meetings held at the Castle Arcade, Queen Street. *President*—Samuel W. Allen, M.I.M.E. *Vice-Presidents*—Jonas Watson, J.P., Walter Insole, T. Mansel Franklen, E. H. Burton, Alexander Kellar, C. F. Gooch, J.P. *Council*—W. H. Kitchen, Frederick Heitzman, William Herbert, Alfred Freke, William Foster, A. McKinnon, D. C. McCallam, William Booth, W. Cocks, Rev. A. T Fryer, W. J. Jenkins, C. E. Hancock, A. Montgomery. *Treasurer*—G H. Willis, jun. *Secretary*—T. H. Faulks, 127 Bute Road, Cardiff.

Cheltenham Amateur Photographic Society.—(ESTABLISHED 1865.)—Place o' Meeting, The College Pharmacy, Cheltenham. *President*—General F. Dawson, C.B. *Vice-President*—Colonel H. M. Saunders. *Committee*—W. H. Bagnall, W. Beetham, Dr. G. B. Ferguson, L. Winterbotham. *Seeretary*—Philip Thomas, York House, Cheltenham.

Chester Society of Natural Science and Literature (Photographic Section).—(ESTABLISHED 1887.)—Meetings held at the Grosvenor Museum, Chester. *President*—Henry Stolterfoth, M.A., M.D., J.P. *Committee*—P. K. Allen, E. G. Ballard, A.R.S.M., F. Evans, F. T. Farrimond, C. W. Townshend, T. Wakefield. *Secretary and Treasurer*—J. H. Spencer, 36 Bridge Street, Chester.

Chichester Photographic Society.—(ESTABLISHED 1893.)—Affiliated to the Royal Photographic Society. Meetings are held at St. Martin's Hall, Chichester. *President*—George Woodbridge, J.P. *Vice-Presidents*—Dr. F. V. Paxton, Colonel Paxton, Dr. E. H. Buckell. *Committee*—R W. Dawtrey, E. C. Hollebone, E. Thorp, F. B. Tompkins, G. M. Turnbull. *Treasurer*—Thomas H. Vinall. *Secretary*—Ernest A. Long, 15 East Street, Chichester.

Chorley Photographic and Sketching Club.—(ESTABLISHED 1894.)—Meetings held at West Street, Chorley. *President*—John Stanton. *Vice-Presidents*—S. Morris, H. R. Dorning, J. T. Brierley, T. Haworth, N. Alker. *Committee*—J. R. Waring, William Waring, E. Lang, W. Swarbrick, J. Rawlinson, A. Collier. *Treasurer*—R. Gill. *Secretary*—Thomas Brindle, 62 Market Street, Chorley.

City and Guilds of London Technical College, Finsbury, Photographic Society.—(ESTABLISHED 1886.)—Meetings held at the Finsbury Technical College, Leonard Street, City Road, E.C. *President*—R. Meldola, F.R.S., F.I.C., F.C.S. *Vice-President*—J. Castell Evans, F.I.C. *Committee*—C. R. Dow, J. Morris, W. P. Plowden, H. Staynes. *Hon. Treasurer and Librarian*—T. H. Norris, A.I.C. *Hon. Secretaries*—W. L. C. Butter and F. W. Bunyan.

City of Belfast Y.M.C.A. Camera Club.—(ESTABLISHED 1889.)—Meetings held at 14 Wellington Place, Belfast. *President*—W. J. D. Walker. *Vice-Presidents*—F. Megarry, J.P., William Strain, T. F. Bell, T. B. Scott. *Committee*—E. Bingham, T. Knox, J. A. Pollock, A. George, A. R. Hogg, H. Hill. *Secretary and Treasurer*—J. McCleery, 14 Wellington Place, Belfast. *Assistant Secretary*—E. N. Bingham.

City of Dublin Y.M.C.A. Camera Club.—(ESTABLISHED 1891.)—*President*—E. MacDowel Cosgrave, M.D. *Vice-Presidents*—Greenwood Pim, M.A., Victor Smyth, J. C. Ruthven, Leonard R. Strangways, M.A., Fred Eason. *Council*—G. A. Parnell, Robert Stewart, A. E. Campbell, W. Barnes, D. MacKellar, J. P. Lewis, Charles E. Stewart, S. C. West, G. W. Riky. *Judges at Exhibition*—Greenwood Pim, M.A., and Leonard R. Strangways, M.A. *Lantern Committee*—C. E. Stewart, G. A. Parnell, W. Barnes. *Hon. Treasurer*—J. George O'Neill. *Hon. Secretary*—Edmund C. Matson, 34 Capel Street. *Assistant Hon. Secretary*—R. J. Wilkin.

Clapham Y. M. C. A. Photographic Club.—(ESTABLISHED 1892.)—Meetings are held at the Bedford Hall, High Street, Clapham, S.W. *President*—R. D. Gibbs. *Secretary*—G. I. Ninnes, 57 Montholme Road, New Wandsworth, S.W.

Cleveland Camera Club (late Erimus Amateur Photographic Club.)—(ESTABLISHED 1888.)—Headquarters, 55 Wilson Street, Middlesbrough. *Vice-Presidents*—Dr. W. W. Stainthorpe, J. J. Burton, G. D. Winter, A. McPherson, C. L. Bell, J. S. Calvert, W. J. Williams, M.D. *Committee*—J. V. W. Wood (Chairman), J. J. Dales, W. Tarrant, R. Moore, H. H. Taylor, J. Sanderson, H. V. Walker. *Secretary*—F. W. Pearson, Victoria Road, Middlesbrough.

Cleckheaton Mechanics' Institute Photographic Society.—(ESTABLISHED 1895.)—Meetings held at the Technical School, Brooke Street. *President*—Dr. F. Farrow. *Vice-Presidents*—J. Goldsbrough, A. E. Knowles, H. S Atkinson. *Committee*—E. Ellis, F. Slinger, E. Blackburn, E. W. Taylor, G. Moulson, Arthur Smith, C. H. Cadman. *Treasurer*—Frank Hirst. *Secretary*—William Drake, 7 Westgate, Cleckheaton.

Clydesdale Camera Club.—(ESTABLISHED 1889.)—Place of Meeting, Wemyss Bay, Scotland. *President*—Henry Erskine Gordon. *Secretary and Treasurer*—Miss Burns, Castle Wemyss, Wemyss Bay, N.B.

Colne Camera Club.—(ESTABLISHED 1893.)—Meetings held at the Cloth Hall, Colne. *President*—Rev. T. Leyland. *Vice-Presidents*—J. Duckworth, H. Hewitt, J. Hey. *Committee*—T. Leyland, J. Duckworth, J. Hey, H. Hewitt, J. Rattcliffe, W. W. Kirk. *Treasurer*—Jonas Rattcliffe. *Secretary*—William Watson Kirk, 16 Atkinson Street, Colne, Lancashire.

Cornish Camera Club.—(ESTABLISHED 1888.)—Meetings held at 22 Market Place, Penzance (*pro tem.*). *President*—W. E. Baily, F.L.S., C.C. *Vice-President*—Dr. B. Vivian. *Council*—R. Pearce Couch, A. R. F. Evershed, M.R.C.S., J. Branwell, jun., Barnes Richards. *Treasurer*—R. Pearce Couch. *Secretary*—H. Tonkin, 22 Market Place, Penzance.

Coventry and Midland Photographic Society.—(ESTABLISHED 1883.)—Meetings held at the Y.M.C.A. Room, Cross Cheaping, Coventry. *President*—William Andrews, F.R.G.S. *Vice-Presidents*—Henry Sturmey, H. D. Waters, W. Sexton, E. J. Walker. *Council*—W. R. Goate, A. L. Bill, F. W. Hardy, T. J. Harker. *Secretaries*—H. Mountfort, 12 Coundon Street, Coventry, and A. B. Clarke, Hampton House, Coventry.

Crewe Amateur Photographic Society.—(ESTABLISHED 1889.)—Meetings held at the Studio, Chester Bridge. *President*—Rev. W. G. Rainsford, D.D. *Vice-President*—E. Booth. *Committee*—J. Lewis, G. Holden, E. Crooke. *Treasurer*—John Cherrey. *Secretary*—Thomas Gorrell, 106 Edleston Road.

Cromwell Photographic Club.—(ESTABLISHED 1891.)—Meetings are held at the Cromwell Hotel, Hall Quay, Great Yarmouth. *President*—R. H. Inglis-Palgrave, F.R.S. *Vice-Presidents*—Miss V. Buxton, F. Burton, C. S. Watson, John Bateley, M.D. *Committee*—Hubert Palmer, Alfred Price, R. T. Brain, William Denew, Thomas Goate, E. G. Leech, Thomas Blyth, George Rumbold, M. Morgan. *Treasurer*—T. W. Swindell. *Secretary*—Charles Rumbold, 4 Dene Side, Great Yarmouth.

Croydon Camera Club.—(ESTABLISHED 1890.)—Affiliated to the Royal Photographic Society. Meetings are held at the Club Rooms, 1 Park Lane, George Street, Croydon. *President*—Hector Maclean, F.G.S., F.R.P.S. *Vice-Presidents*—James Glaisher, F.R.S., The Right Hon. C. T. Ritchie, M.P., Alderman F. T. Edridge. *Vice-Chairman*—J. Packham, F.R.P.S., F.R.H.S. *Council*—W. Burn, A. W. Hirst, A. E. Isaac, G. W. Jenkins, A. Jenkins, G. Linton, J. Noaks, J. Packham, F.R.P.S., W. H. Rogers, J. Smith, G. W. Watson, S. H. Wratten. *Hon. Lanternist*—A.E. Isaac. *Delegates to R.P.S. Affiliation Committee*—Messrs. Maclean and Packham. *Hon. Secretary*—H. E. Holland, 69 Lansdowne Road.

Croydon Microscopical and Natural History Club (Photographic Section).—(ESTABLISHED 1870.)—Meetings held at the Public Hall, George Street, Croydon. *President* — W. Murton Holmes. *Vice-Presidents* — John Berney, F.R.M.S., Philip Crowley, F.Z.S., F.L.S., H. S. Eaton, M.A., F.R.Met. Soc., H. T. Mennell, F.L.S., H. G. Thompson, M.P. J.P., &c., E. Lovett, H. F. Parsons, M.D., F.G.S. *Committee*—J. Weir Brown, J. H. Baldock, F.C.S. (Lanternist and Recorder), C. F. Oakley, Alfred Roods (Librarian), C. H. Burnaby Sparrow. *Treasurer*—E. B. Sturge. *Secretary*—Harry D. Gower, 55 Benson Road, Waddon, Croydon, Surrey.

Cyclists' Photographic Portfolio Club.—(ESTABLISHED 1886.)—*Secretary*—A. B. Clarke, Hampton House, Coventry.

Darlington Photographic Society.—(ESTABLISHED 1887.)—Meetings held at the Imperial Hotel. *President*—S. C. Rudman. *Vice-President*—William Mossom. *Committee*—P. J. Cooper, J. T. Dodds, J. Robinson, W. Ferguson. *Secretary and Treasurer* — J. Calvert, 64 North Road, Darlington.

Darwen Photographic Association.—(ESTABLISHED 1894.)—Meetings held at the Belgrave Schools, Bolton Road entrance. *President*—Rev. Henry Irving. *Vice-Presidents*—George Butterworth and J. W. Cooper. *Committee*—James Cavis, John F. Leach, John W. Smith, Albert Almond, James Cooper, Richard Holden, John T. Taylor, John A. Hargreaves. *Treasurer*—Joseph Thomas. *Secretary*—Richard H. Duckworth, 445 Bolton Road, Darwen.

Derby Photographic Society.—(ESTABLISHED 1884.)—Meetings held at the Derby Mechanics' Institute. *President*—Captain W. de W. Abney, C.B., R.E., F.R.S., &c. *Vice-President*—Arthur B. Hamilton. *Committee*—W. R. Bland, C. Bourdin, E. Fearn, R. J. Fleet, C. B. Keene, T. A. Scotton, J. W. Smith, G. Walker, T. Walker. *Treasurer*—F. H. Gandy. *Secretary*—A. H. Bennett, 137 Normanton Road, Derby.

Devon and Cornwall Camera Club.—(ESTABLISHED 1888.)—Meetings held at the Athenæum, Plymouth, fortnightly on Tuesday evenings. *President*—Colonel R. Barrington Baker. *Vice-Presidents*—W. G. Tweedy, B.A., and R. Burnard. *Council*—Dr. Aldridge, Messrs. Micklewood, D. Roy, Watson, Turney, and Hawker, Miss Hemsley, Miss Keen. *Hon. Treasurer*—C. R. Rundle, M.R.C.S. *Hon. Secretary*—R. Hansford Worth, C.E., 42 George Street, Plymouth.

Devonport Camera Club.—(ESTABLISHED 1891.)—Meetings are held at the Oddfellows Hall, Ker Street, Devonport. *President*—J. Crook. *Vice-Presidents*—C. Croydon, — Bassett, J. F. Coombes, C. Dart. *Committee*—Messrs. Moore, Dymond, Trend, and Turney. *Treasurer*—R. Lamb. *Secretary*—E. James Seymour, F.R.M.S., 18 St. Aubyn Street, Devonport.

Doncaster Scientific Society.—(ESTABLISHED 1880.)—Meetings held at the Free Library, Doncaster. *President*—M. H. Stiles. *Vice-Presidents*—J. B. Purser, W. E. Atkinson, J. Mitchell Wilson, M.D., F.C.S. *Committee*—W. Roberts, G. B. Bisat, T. Cuttriss, Mrs. Corbett, Mrs. Robinson, T. W. Plant. *Secretary and Treasurer*—H. H. Corbett, M.R.C.S., 19 Hallgate, Doncaster.

Dorset Amateur Photographic Association.—(ESTABLISHED 1886.)—Place of Meeting, Dorchester. *President*—Rev. W. M. Barnes, M.A. *Committee*—Miss E. Williams, T. A. Colfax, R. W. Copeman. *Secretary and Treasurer*—Rev. T. Perkins, M.A., F.R.A.S., Turnworth Rectory, Blandford.

Dukinfield Photographic Society.—(ESTABLISHED 1888.)—Meetings held at the Society's Room, Co-operative Hall. *President*—T. Hodgetts Gordon, B.A., C.C. *Vice-Presidents*—S. T. Ainsworth, J. W. Hadfield, John T. Lees. *Committee*—J. W. Andrew, R. Deakin, W. Jenkinson, P. Rigby, S. Woolley. *Hon. Librarian*—H. Broadbent. *Hon. Treasurer*—J. Winterbottom. *Hon. Secretary*—W. H. Shirley, Woodbine Terrace, Dukinfield.

Dulwich Photographic Society.—(ESTABLISHED 1895.)—Meetings held at the Constitutional Club, East Dulwich Grove. *President*—Sir J. Blundell Maple, M.P. *Vice-President*—J. A. Causton. *Committee*—H. C. Jackson, C. E. Dunlop, A. Willcocks, H. J. Ellis, E. W. Beer, A. W. Hanson. *Treasurer*—C. Dunlop. *Secretary*—Herbert J. Ellis, 46 Ondine Road, East Dulwich, S.E.

'Dundee Advertiser' Photographic Club.—(ESTABLISHED 1894.)—Meetings held at Mather's Hotel, Dundee. *Hon. President*—Sir John Leng, M.P. *President*—J. L. Scott. *Vice-President*—J. A. Mackenzie. *Committee*—Alexander F. Gow, Edmund Roscol, James Moffat. *Secretary and Treasurer*—Archibald Campbell, 134 Albert Street, Dundee.

Dundee and East of Scotland Photographic Association.—(ESTABLISHED 1879.)—Meetings held at Lamb's Hotel, Dundee. Club Room, 39 High Street, Dundee. *President*—Professor J. E. A. Steggall. *Vice-Presidents*—W. Bertie and G. G. Maclaren. *Council*—W. F. Hill, T. L. Wynd, Dr. Tulloch, J. S. Lawson, J. Thow, A. Wilson, J. Ogilvie, T. Berry, P. Kilgour, W. Salmond, A. Stewart, W. H. Tittensor. *Secretary and Treasurer*—V. C. Baird, Broughty Ferry, N.B.

Dunstable Photographic Society.—(ESTABLISHED 1894.)—Meetings held at the Dunstable Institute. *President*—A. D. Hughes, M.D. *Vice-President*—L. C. R. Thring, M.A. *Treasurer*—Albert Gutteridge. *Secretary*—Edward Hare, The Poplars, Dunstable.

Durham City Camera Club.—(ESTABLISHED 1892.)—Meetings held at the Shakespeare Hall, North Road, Durham. *President*—Captain E. White. *Vice-Presidents*—R. H. Blyth and E. Meynell. *Council*—F. Cluff, T. Harker, I. F. Hobson, J. Morson. *Treasurer*—Councillor William Gray. *Secretary*—Robert Hauxwell, The Avenue, Durham.

Ealing Photographic Society.—(ESTABLISHED 1890.)—Meetings held at the Public Buildings, Ealing. *President*—H. W. Peal. *Vice-Presidents*—H. C. Draper, Charles Jones, T. Simpson, W. T. White. *Council*—Dr. Clifford Gibbons, W. G. Gregory, Dr. H. McD. Phillpotts, A. Ernest Smith, W. G. Wagner, Roland Whiting. *Treasurer*—A. F. Taylor. *Secretary*—R. Yoakley Murphy, Argyle Road, Ealing, W.

Eastbourne Photographic Society.—(ESTABLISHED 1892.)—Meetings are held at the School of Art, Cornfield Road. *President*—Henry Habgood, M.D. *Vice-Presidents*—H. Michell Whitley, Rev. H. G. Jameson, B. Fox Watkins. *Committee*—J. Coster, — Ellmore, Ellis Kelsey, T. McQueen, H. P. Molineux, H. Sparks, W. Sparrow, G. D. Plomer. *Secretary and Treasurer*—John J. Hollway, 11 Hyde Gardens, Eastbourne.

East London Photographic Society.—(ESTABLISHED 1890.)—Meetings held at the Shoreditch Town Hall, E.C. *President*—John H. Gear. *Vice-Presidents*—C. Stone, C. Tyler, M. A. Wilkinson. *Council*—A. Barnard, G. E. Bennett, A. Copping, G. Overy, jun., C. Uffindell. *Secretary*—W. L. Prosser, 76 Ridley Road, Dalston, N.E.

East Worcestershire Camera Club.—(ESTABLISHED 1894.)—Meetings held at the Institute, Bromsgrove. *President*—C. R. Sayer. *Vice-Presidents*—Austen Chamberlain, M.P., George E. Abell, J.P., H. Millington, M.A., R. Smallwood, J.P. *Council*—W. J. Brooke, J. P. Croft, P. K. Tollitt, M.A., D. L. Raimbach, F. E. Slater, Miss Sayer. *Treasurer*—G. W. Widdowson. *Secretary*—O. Giles, The Crescent, Bromsgrove.

Eccles Photographic Society.—(ESTABLISHED 1894.)—Meetings held at the Eccles Grammar School. *President*—J. H. Crocker, M.D. *Vice-Presidents*—A. Bowes, A.M.I.C.E., and T. Thistlethwaite. *Committee* Messrs. Atkinson, Anderson, Hughes, Tetlow, and Scholes. *Treasurer*—A. Bowes. *Secretary*—J. H. Holland, 3 Hall's Buildings, Eccles.

Edinburgh Camera Club.—(ESTABLISHED 1890.)—*President*—P. J. Stirling Boyd, M.A., D.L. *Acting Committee*—Miss Balfour, William Ford, and the President and Secretary (*ex officio*). *Hon. Secretary and Treasurer*—Henry Tod, W.S., F.S.A Scot., 45 Castle Street and 23 Lennox Street.

Edinburgh Photographic Club.—(ESTABLISHED 1881.)—Meetings are held at 38 Castle Street. *President*—Frank P. Moffat. *Treasurer*—Thomas Wardale. *Secretary*—Thomas Barclay, 180 Dalkeith Road, Edinburgh.

Edinburgh Photographic Society.—(ESTABLISHED 1861.)—Meetings held at 38 Castle Street, Edinburgh. *President*—F. P. Moffat. *Vice-Presidents*—James Patrick and Alexander Eddington. *Council*—William Fowler, John Stewart Smith, J. R. Roddick, Charles J. Souter, P. M. Macintyre, J. C. H. Balmain, William Linton, J. B. Johnstone, Robert Ayton, H. Scott Lander, James Hay, James Ritchie. *Librarian*—John Anderson. *Treasurer*—George Cleland. *Secretary*—J. S. McCulloch, W.S., 2 George Street, Edinburgh.

Edinburgh University Photographic Society.—(ESTABLISHED 1890.)—Meetings held at 3 Bristo Place, Edinburgh. *President*—Dr. T. W. Drinkwater. *Vice-Presidents*—Dr. Logan Turner, Professor Cossar Ewart, Dr. Cathcart. *Committee*—W. P. Craig, E. R. S. Hale, J. G. C. Scott, H. Colman, Ruston Harrison, Wallace McGregor. *Secretary and Treasurer*—H. Overton Hobson, University Union, Park Place, Edinburgh.

Edinburgh Viewfinders' Club.—(ESTABLISHED 1890.)—Meetings are held at 5 Teviot Place, Edinburgh. *Secretary and Convener*—Thomas W. Drinkwater, Ph.D., L.R.C.P., 5 Teviot Place, Edinburgh.

Eton College Photographic Society.—(ESTABLISHED 1891.)—Place of Meeting, Eton College. *President*—Rev. T. C. Porter. *Treasurer*—G. Blacklock. *Hon. Secretary*—J. V. Ramsden.

'Evening Times' Camera Club.—(ESTABLISHED 1895.)—Meetings held at 46 Gordon Street, Glasgow. *Patrons*—Sir James Bell, Bart., Councillor John Ure Primrose, Bailie Alexander Sinclair. *President*—A. H. Duncan. *Vice-Presidents*—A. Lindsay Miller, Robert Burnie, Robert Taylor, Dr. J. A. Wilson. *Committee*—Robert Sproul, George Rae, J. H. A. MacIntyre, K. M'Lean, W. M. Gossip, J. D. Sloan, W. G. Mackie, D. R. Macdonald, James Brough, A. H. Goodfellow, J. C. Paterson, J. L. Crichton, J. Christie. *Lanternist*—Robert Dalziel. *Librarian*—W. M. Gossip. *Treasurer*—John Fairie, C.A. *Secretaries*—H. C. Shelley and J. M. Ewing.

Exeter Camera Club.—Meetings are held at City Chambers, Gandy Street, Exeter. *President*—Charles Cole. *Vice-Presidents*—W. Brock and J. W. Huggins. *Council*—H. J. Stanbury, H. C. Bamfylde, F. Martin, A. W. Gregory, C. R. M. Clapp. *Hon. Librarian*—E. Pocknell. *Hon. Lanternist*—F. Green. *Treasurer*—J. Hinton Lake. *Secretary*—W. Lloyd Jones, Fern Villa, Clifton Hill, Exeter.

Fakenham District Camera Club.—(ESTABLISHED 1892.)—Meetings held at the Lancaster Temperance Hotel, Fakenham. *President*—Rev. William Martin, B.A. *Vice-Presidents*—Thomas Charlton, Algernon Digby, M.A., Rev. A. E. Humphreys, M.A. *Committee*—H. H. Charlton, R. W. Dewing, G. H. Davis, H. R. C. Davis. *Secretary and Treasurer*—Henry Newson, The Square, Fakenham, Norfolk.

Falkirk Amateur Photographic Association—(ESTABLISHED 1889.)—Meetings held at Newmarket Street. *President*—George Sherriff. *Vice-President*—T. T. Blackadder. *Committee*—Messrs. Johnstone, Hume, Lyon, J. S. Higgins, Chalmers, and Boyd. *Treasurer and Assistant Secretary*—William C. Murray. *Secretary*—John Higgins, High Street, Falkirk.

Faversham Institute Photographic Society.—(ESTABLISHED 1890.)—Meetings held at the Faversham Institute. *President*—Earl Sondes. *Vice-Presidents*—Captain C. F. Hooper, W. C. Stunt, C. T. Evers, M.D. *Committee*—A. N. Filmer, F. C. Jackman, C. Cremer, R. S. Dunn, E. Holladay, M. Laxon. *Secretary and Treasurer*—Charles H. Semark, Stone Street, Faversham.

Gainsborough and District Camera Club.—(ESTABLISHED 1894.)—Meetings held at the Coffee Tavern. *President*—F. J. Cribb. *Vice-Presidents*—E. J. Clark and R. C. Puckering. *Committee*—J. W. Brocksom, E. G. Pepper, W. E. White, A. Johnson. *Treasurer*—A. G. Surfleet. *Secretary*—R. C. Puckering, Clinton House, Gainsborough.

Glasgow and West of Scotland Amateur Photographic Association.—(ESTABLISHED 1882.)—Meetings held at 180 West Regent Street, Glasgow. *President*—George Chalmers. *Vice-President*—Thomas Steventon. *Council*—W. G. Buchanan, Thomas W. Robertson, John Taylor, Archibald Watson, Dr. H. W. Williams, James L. Gardner. *Treasurer*—William J. B. Halley. *Secretaries*—William Goodwin, 3 Lynedoch Street, and J. C. Oliver, 2 Royal Terrace.

Glasgow Photographic Association.—(ESTABLISHED 1862.)—*President*—A. Lindsay Miller. *Vice-Presidents*—William Lang, F.C.S., and J. Craig Annan. *Council*—W. J. M'Ilwrick, George Mason, J. E. Hanbidge, R. C. Platt, J. C. Oliver, John Stuart. *Treasurer*—George Bell. *Secretary*—Frederick Mackenzie, 122 Wellington Street.

Glenalmond Photographic Club.—(ESTABLISHED 1890.)—Meetings held at Trinity College, Glenalmond, Perthshire.

Glossop Dale Photographic Society.—(RE-ESTABLISHED 1883.)—Meetings held at Norfolk Square, Glossop. *President*—Captain E. Partington, J.P. *Vice-Presidents*—Colonel Sidebottom, M.P., Lieutenant S. H. Wood, Mrs. S. Wood. *Treasurer*—J. Hardman. *Secretary*—T. W. Sharpe, 1 Pike's Lane, Glossop.

Gloucestershire Photographic Society.—(RECONSTRUCTED 1887.)—Meetings held at the Guildhall, Gloucester. *President*—William Hodges, M.R.C.S. *Vice-President*—R. W. Dugdale. *Committee*—George Embrey, F.C.S., A. H. Pitcher, W. Walwin. *Treasurer*—Henry S. Crump. *Secretary*—F. H. Burr, Upper Linden Road, Gloucester.

Goldsmiths' Institute Camera Club.—(ESTABLISHED 1893.)—Meetings held at the Goldsmith's Institute, New Cross. *President*—J. W. Penfold. *Vice-Presidents*—J. S. Redmayne, B.A., A. H. Wood, B.A., A. G. Bloxam, F.I.C., A. L. Spiller, F.R.P.S., Miss B. Griffiths. *Committee*—Messrs. Donald, Hodge, Lindwall, Pook, Jones, Toplis; Misses Grimmett and Davidson. *Hon. Secretary and Treasurer*—W. H. Sidgwick.

Goole Photographic Society.—(ESTABLISHED 1890.)—Meetings held at the Exchange, Goole. *President*—Robert Blair, J.P., M.D. *Vice-President*—T. C. Turton. *Committee*—Messrs. Turton, Medgley, Buck, Timms, Simpson, and Kettle. *Secretary*—S. Wells, Airmyn, Goole.

Gospel Oak Photographic Society.—(ESTABLISHED 1894.)—Meetings held at the Congregational Schools, Lismore Road, Gospel Oak, N.W. *President*—Rev. H. Le Pla. *Vice-President*—F. H. Hall. *Committee*—W. Beyer, J. Gittens, J. Hingston, J. Pridham, C. Stone. *Treasurer*—W. H. Rollason. *Secretary*—William Alfred Palmer, 13 Dale Road, Kentish Town, N.W.

Graphic Society.—(ESTABLISHED 1885.)—Meetings held at the Mechanics' Institute, Plymouth. *President*—S. Kerswell. *Council*—W. G. Tweedy, Miss Gidley, E. H. Micklewood, Miss Steele, and the President, Treasurer, and Secretary. *Treasurer*—G. F. Watson. *Secretary*—J. S. Hawker, Mutley House, Plymouth.

Gravesend Photographic Society.—Meetings held at the Medical Hall Rooms, Edwin Street, Gravesend. *President*—J. C. Johnson, J.P. *Vice-President*—E. J. Wall. *Council*—Percy J. Boorman, Horatio Sandford, B. L. Rankin, F. H. Wells, Thomas Nettleingham, S. R. Macartney, G. W. Cobham. *Treasurer*—J. H. Morris. *Secretary*—T. L. Winnett, 5 The Grove, Gravesend.

Great Yarmouth Amateur Photographic Association.—(ESTABLISHED 1893.)—Meetings are held fortnightly on Monday evenings, at the Bridge Hotel, Southtown, Great Yarmouth. *Secretary and Treasurer*—George T. Davis, 4 Market Place, Great Yarmouth.

Great Yarmouth Camera Club.—(ESTABLISHED 1891.)—Meetings are held at the Presidents and Members' Houses. *President*—Dr. Adcock. *Vice-President*—Rev. E. Rainbow. *Committee*—A. Price, Percy Wiltshire, H. D. Arnott, Rev. D. H. Battersby, E. Swann. *Treasurer*—John Taylor. *Secretary*—H. Harvey George, The Tower, Gorleston, Great Yarmouth.

Greenock Camera Club.—(ESTABLISHED 1888.)—Meetings held at the Watt Museum Lecture Hall, Kelly Street, Greenock. *President*—Matthew Blake. *Vice-President*—William Blair. *Council*—George Dunlop, Hugh Watson, J. A. Stirling, T. A. Cunningham, R. W. Jamieson. *Treasurer*—Alexander Bathgate. *Secretary*—John Paul, 28 Esplanade, Greenock.

Grimsby and District Photographic Society.—(ESTABLISHED 1894.)—Meetings are held at 28A Victoria Street, Grimsby. *President*—J. Sutcliffe. *Vice-Presidents*—R. C. Long and Dr. Simpson. *Committee*—E. Matthews, A. T. Flint, W. Brumpton, C. Dewing, C. Wilmott, A. H. Hewitt, T. J. Botterill, W. Meritt, J. T. Tuxworth, W. H. Marris, T. E. Gale. *Treasurer*—H. Dodds. *Secretary*—J. H. Clayton, Elm House, Tasburgh Street, Grimsby.

Guildford Photographic Society.—(ESTABLISHED 1890.)—Meetings held at 36 High Street, Guildford. *President*—The Right Hon. the Earl of Onslow, G.C.M.G. *Vice-Presidents*—A. Horsley Hinton, G. J. Jacobs, J. Russell. *Council*—R. W. Fielder, T. L. Inman, A. J. Moon, G. C. Williamson. *Treasurer*—J. H. Nunn. *Secretary*—A. E. Moon, 36 High Street, Guildford.

Hackney Photographic Society.—(ESTABLISHED 1889.)—Meetings held at the Pembury Hotel, Amhurst Road, Hackney. *President*—Thomas Bedding, F.R.P.S. *Council*—A. Barker, R. Beckett, F. W. Gosling, F. Houghton, E. Puttock, W. Rawlings, L. S. Wilks, Major Woolmer-Williams. *Librarian*—Arthur Dean. *Lanternist*—Dr. Roland Smith. *Treasurer*—J. O. Grant. *Hon. Secretary*—W. F. Fenton-Jones, 12 King Edward Road, Hackney. *Assistant Secretary*—A. D. Fort.

Halifax Camera Club.—(REORGANIZED, 1895.)—Meetings held at 29 Northgate, Halifax. *President*—J. Ingham Learoyd. *Vice-Presidents*—James Bramley and Harry Mortimer. *Committee*—Haley Hollas, Henry Hollas, J. W. Holland, C. Foster, T. Wardle, G. Dyson. *Secretary and Treasurer*—Arthur Priestley, 7 Commercial Street, Halifax.

Halifax Photographic Club.—(ESTABLISHED 1881.)—Meets the last Thursday in each month in the Mechanics' Hall at half-past seven, p.m. *President*—B. Rowley. *Vice-Presidents*—T. Illingworth and E. J. Smith. *Council*—B. B. Bingley, Major Holroyde, H. Mossman, Councillor S. Smith, Joseph Whiteley, together with the Officers. *Auditor*—S. Goodman. *Treasurer*—E. H. Child. *Hon. Secretary*—W. Clement Williams, 13 Aked's Road, Halifax.

Haltwhistle and District Photographic Association.—(ESTABLISHED 1889.)—Meetings are held at the Association's Rooms, Haltwhistle, Carlisle. *President*—Dr. W. R. Speirs. *Vice-President*—Major Anne. *Hon. Secretary and Treasurer*—David Macadam, London and Midland Bank Limited, Haltwhistle.

Hamilton Photographic Association.—(ESTABLISHED 1894.)—Meetings held at Castle Street, Hamilton. *Hon. President*—John Watson. *President*—William Burrie. *Vice-President*—John Dick, M.A. *Council*—Robert A. Wright, D. N. Cross, J. D. Rankin, P. Tanish, J. C. Pollock, C. F. Freer. *Hon. Treasurer*—George L. Brown. *Hon. Secretary*—William Macaulay, British Linen Company's Bank, Hamilton.

Handsworth Photographic Society.—(ESTABLISHED 1894.)—Meetings held at College House, Hamstead Road, Birmingham. *President*—Philip Whitehouse. *Vice-Presidents*—Dr. W. J. Foster, L.R.C.P., E. F. Freeland, C. F. Jarvis, E. J. Timings. *Council*—J. H. Brindley, W. Duff, W. J. Foster, jun., W. J. Morgan, G. Owen, J. H. Petit, T. J. Richardson. *Treasurer*—C. L. Stait. *Secretary*—A. E. Segnitz, 141 Hall Road, Handsworth, Birmingham.

Hastings and St. Leonards Photographic Society.—(ESTABLISHED 1888.)—*Secretary*—Algernon Brooker, 21A Wellington Place, Hastings.

Helios Postal Photographic Club.—(ESTABLISHED 1887.)—A Postal Photographic Club, circulating portfolios amongst the members for the insertion of photographs, which are mutually criticised upon forms supplied for the purpose. The Club possesses two portfolios, and the circulation is arranged with a view to each member receiving one every month. *Secretary and Treasurer*—Henry Everett, 125 St. Paul's Road, Bow, London, E.

Herefordshire Photographic Society.—(ESTABLISHED 1888.)—Meetings held at Clarence House, West Street, Hereford. *President*—Alderman T. Blake, J.P. *Vice-Presidents*—A. Watkins, T. J. Salwey, J. Parker, C.E., W. M. Wilson, W. J. Humfrys, Rev. G. H. Morgan. *Council*—E. W. H. Chave, A. C. Edwards, A. E. Elliott, C. H. Woodhouse, E. Stephens, E. Horth, A. C. Slatter, W. Groom. *Treasurer*—W. E. Haines. *Secretary*—Cecil Gethen, 9 St. Nicholas Street, Hereford.

Holborn Camera Club.—(ESTABLISHED 1889.)—Meetings held at 138 Salisbury Court, Fleet Street, E.C. *President*—D. R. Lowe. *Vice-Presidents*—F. Brocas, S. T. Chang, F. Knights. *Committee*—H. Cobb, A. Hodges, E. Hodges, F. J. Cobb. *Librarian and Assistant Secretary*—H. G. Trayfoot. *Treasurer*—Albert Bell. *Secretary*—John Brittain, jun., 52 Hilldrop Road, Camden Road, N.

Holmfirth Amateur Photographic Association.—(ESTABLISHED 1885.)—*President*—Arthur Preston. *Secretary and Treasurer*—David Bilson, Birchin House, Holmfirth.

Hove Camera Club.—(ESTABLISHED 1892.)—Meetings are held in Hove Town Hall. *President*—G. B. Woodruff, J.P. *Vice-Presidents*—C. Job, H. H. Taylor, F.R.C.S., A. J. Richardson, M.D., W. J. Trentler, M.D. *Committee*—C. Berrington Stoner, A. H. C. Corder, R. Chrisnes. *Treasurer*—J. Williamson. *Secretary*—E. E. Mainwaring, M.R.C.S., L.R.C.P., 73 Lansdowne Place, Hove, Brighton.

Huddersfield Naturalist and Photographic Society.—(ESTABLISHED 1893.)—Meetings held at the Y.M.C.A. Lecture Room. *President*—H. G. Brierley. *Vice-Presidents*—Councillor F. Crossland and T. W. Woodhead. *Treasurer*—A. W. Whiteley. *Secretary*—A. Clarke, 9 St. Andrew's Road, Huddersfield.

Hull Photographic Society.—(ESTABLISHED 1884.)—Meetings are held at 71 Prospect Street, Hull. *President*—A. H. White. *Vice-Presidents*—Rev. Hay Fea, M.A., and John Pybus. *Hon. Lanternists*—A. E. Spaven and E. H. Hellier. *Hon. Librarian*—B. H. Brewer. *Hon. Treasurer*—W. M. Lyth. *Hon. Secretaries*—J. V. Saunders, 151 Park Avenue, and R. E. Johnson, Balmoral Terrace, Anlaby Road.

(Inverness) Highland Photographic Society.—(ESTABLISHED 1895.)—Meetings held at the Studio, 21 Inglis Street, Inverness. *President*—Rev. J. H. Crick. *Vice-Presidents*—Alexander F. Mackenzie and John S. Nicholls. *Committee*—Alexander Mayne, John Sinclair, Alexander Rose, John Todd, Alistair Grant, David Taylor, John Mackenzie. *Secretary and Treasurer*—Arthur G. Stewart, Hill Place.

Ipswich Scientific Society (Photographic Section).—(ESTABLISHED 1869.)—Meetings are held at the Ipswich Museum. *President*—Thomas Miller, M.I.C.E. *Committee*—W. C. Block, J. S. Corder, S. A. Notcutt, E. P. Ridley, W. Vick, F. Woolnough. *Treasurer*—Henry Miller. *Secretary*—Frank Woolnough (Sectional), Museum, Ipswich.

Isle of Thanet Photographic Society.—(ESTABLISHED 1888.)—Affiliated to the Royal Photographic Society. Meetings held at the Church Club, Broad Street, Ramsgate. *President*—Rev. H. Bartram, M A. *Vice-Presidents*—Rev. C. E. Eastgate, M.A., G. Dowker, F.G.S., W. Saunders, L.D.S., R.C.S.I., J. H. Forwalk, F.R.H.S. *Committee*—G. F. Blower, E. Deacon, W. F. Roberts, A. D. Sackett, A. R. Skellet, A. L. Spratling. *Hon. Lanternist*—J. H. Forwalk. *Hon. Secretary and Treasurer*—J. C. Goldsack, Fletland House, The Elms, Ramsgate.

Keighley and District Photographic Association.—(ESTABLISHED 1889.)—Meetings held at the Mechanics' Institute, North Street, Keighley. *President*—Alexander Keighley. *Vice-Presidents* -Rev. A. Clarke, J. G. Dickinson, W. Tate. *Committee*—Samuel Bairstow, Thomas Heaps, J. H. Bentley, E. Myers, T. A. Smith, Charles Smith, J. Y. Slater, James Waters. *Treasurer*—Walter Mitchell. *Secretary*—John Gill, 27 Highfield Lane, Keighley.

Kendal Literary and Scientific Institution (Photographic Section)—(ESTABLISHED 1886.)—Meetings held at the Museum. *Chairman*—Gilbert Gilkes. *Committee*—J. Severs, T. Sharpe, J. Sawyers, E. Boundy, C. E. Greenall, and Chairman, Treasurer, and Secretary. *Treasurer*—T. N. Ritson. *Secretary*—George R. Hargreaves, jun., Greenside, Kendal.

Kilmarnock and Ayrshire Photographic Society.—(ESTABLISHED 1887.)—Meetings held at Kilmarnock and Ayr. *President*—Robert Gudgeon. *Vice-President*—Robert Boyd. *Council*—Miss M. McCulloch, Miss Edith M. L. McKerrow, David Craig, Thomas Ferguson, J, Mack Watson. *Treasurer*—Robert Johnstone. *Secretary*—William Paterson, Beech Cottage, Northfield Avenue, Ayr.

King's Lynn Photographic Society.—(ESTABLISHED 1894.)—Meetings held at the C.E.Y.M.S. Rooms, Railway Road. *President*—S. A. Gurney. *Vice-Presidents*—C. W. Croad, J.P., and Rev. H. H. Streeten. *Committee*—J. Clough, W. H. Cockle, A. Taylor. *Secretary and Treasurer*—H. Tilson, Railway Road, Lynn.

King's Lynn Y.M.C.A. Photographic Club—(ESTABLISHED 1896.)—Meetings are held at the Y.M.C.A. Rooms, St. James's Street. *Committee*—J. O. Reynolds (Chairman), G. M. Bridges, Mrs. Andrews, S. Smyth, Mrs. Ramsell, B. Johnsen. *Treasurer*—E. H. Andrews. *Hon. Secretaries*—William Lock, 118 Norfolk Street, and F. Hampton, Millfleet Terrace.

Kingston on-Thames and District Photographic Society.—(ESTABLISHED 1893.)—Meetings are held at 10 Palmer Crescent, Kingston-on-Thames. *President*—Rev. G. I. Swinnerton. *Vice-Presidents*—Rev. F. C. Lambert and W. Montagu Robertson. *Committee*—Dr. Cowen, A. Hill, Dr. Luscombe, A. Vandendreische, T. Wilson. *Treasurer*—W. Montagu Robertson. *Secretaries*—Dr. Finny, Kenlis, Kingston Hill, and J. F, East, Uxbridge House, Surbiton,

Lake District Camera Club.—(ESTABLISHED 1894.)—Meetings held at the Lake District Camera Club, Windermere. *President*—J. Bridson, J.P. *Vice-Presidents*—A. Dunlop, J.P., Paul Lange, George Rutter. *Treasurer*—Lieut.-Colonel Reade. *Secretary*—Frederick B. Cattley, Hazelwood, Windermere.

Lancaster Photographic Society.—(ESTABLISHED 1889.)—Meetings held at the Society's Rooms, Stonewell, Lancaster. *President*—A. Garnett. *Vice-Presidents*—J. W. Pickard and R. W. Wearing. *Committee*—N. Holden, J. Crane, J. Parkinson, A. S. Barling, J. B. Briggs (Librarian). *Treasurer*—W. Massey. *Secretary*—W. Briggs, 21 Cheapside, Lancaster.

Lantern Slide Exchange Club.—(ESTABLISHED 1889.)—A postal photographic society for the circulation and exchange of lantern slides. *Secretary and Treasurer*—J. S. Hawker, Mutley House, Plymouth.

Lantern Society.—(ESTABLISHED 1890.)—*Chairman*—J. J. Vezey, F.R.M.S. *Vice-Chairman*—T. H. Holding. *Council*—G. G. Baker-Cresswell, F. H. Evans, C. E. Gladstone, E. K. Hall, W. H. Maw, F.R.M.S., E. M. Nelson, F.R.M.S., J. W. Reed, A. R. Sheppee. *Curator*—J. W. Ashdown. *Hon. Secretary*—William Bashall, 21 Holland Villas Road, London, W.

Leamington Amateur Photographic Society.—(ESTABLISHED 1887.)—Meetings held at the Pump Room, Leamington. *Patron*—The Earl of Warwick. *Hon. President*—Surgeon-General Ranking. *Hon. Treasurer*—B. Magrath. *Hon. Secretary*—Signor Aspa, Priory House, Leamington.

Leeds Camera Club.—(ESTABLISHED 1893.)—Affiliated to the Royal Photographic Society. Meetings held at the Grand Restaurant, Boar Lane, Leeds. *Patrons*—His Worship the Mayor of Leeds (the Right Hon. W. L. Jackson, M.P., J.P.), The Right Hon. Baron Playfair, K.C.B., &c., the Right Hon. H. J. Gladstone, M.P., Sir George Irwin, J.P., G. W. Balfour, M.P., T. R. Leuty, M.P., J. Lawson Walton, Q.C., M.P., Professor T. E. Thorpe (London), LL.D., B.Sc., Ph.D., F.R.S., Councillor J. Gordon, J.P., P. Gilston, J.P., W. Warren, J.P. *President*—Councillor J. Green Hirst. *Vice-Presidents*—Major Norwood, Rev. J. Beanland, Dr. J. T. Thresh, T. Middleton, jun., W. A. M. Brown, A. Homburg. *Committee*—R. Bourke, S. Barnes, G. Dixon, P. Elliff, H. A. Morfitt, H. Stockwell, C. C. Vevers, A. Gaunt, H. F. Wigglesworth. *Hon. Lanternist*—A. Oddy. *Treasurer*—T. R. Thompson. *Hon. Secretaries*—W. R. Irwin, 3 Harold Terrace, and W. A. Daniel, 23 Upperhead Row.

Leeds Photographic Society.—(ESTABLISHED 1852.)—Meetings held at the Mechanics' Institute. *President*—Peter Gilston, J.P. *Vice-Presidents*—J. H. Walker and H. Denison, F.R.P.S. *Committee*—A. W. Atkinson, H. P. Atkinson, Godfrey Bingley, B. A. Burrell, F.I.C., Thomas Coombs, Herbert Denison, P. Gilston, Alfred Naylor, R. W. Savage, J. H. Walker. A. W. Atkinson, *Lanternist.* H. P. Atkinson, *Librarian. Hon. Secretary and Treasurer*—Alfred Naylor, 2 Providence Terrace, Leeds.

Leicester and Leicestershire Photographic Society.—(ESTABLISHED 1885.)—Meetings held in the Mayor's Parlour, Old Town Hall, on the second Thursday in the month. *President*—G. Bankart. *Vice-President*—T. W. Gamble. *Committee*—W. J. Coates, W. Murray, S. Squire, J. Porritt. *Treasurer*—J. Toone. *Secretary*—T. Brown, 68 Church Gate, Leicester.

Leigh Photographic Society.—(ESTABLISHED 1892.)—Meetings are held in the Old Grammar School, Market Place, Leigh. *President*—M. F. Burrows, J.P. *Vice-Presidents*—Dr. Jos. Jones, Robert Leigh, T. Lee Syms, J. Ward, B.A., J. H. Stephens, R. B. Mawson, W. Hampson, T. Peters. *Committee*—J. Berry, T. G. Hirst, W. Crouchley, T. Mercer, P. Seddon. *Treasurer*—Thomas Haddock. *Secretary*—William Rose Moore, 92 Bradshawgate, Leigh.

Leith Amateur Photographic Association.—(ESTABLISHED 1888.)—Meetings held at the Liberal Club. *President*—Robert Hunter. *Vice-President*—R. C. Ewart. *Council*—W. F. Hendrie, T. Wilson, T. W. Dewar, A. D. Guthrie, J. Hislop, W. Seater, W, M. Smith. *Treasurer*—M. Campbell. *Secretary*—Alexander Pitkethly, 8 Wilkie Place, Leith.

Lewes Photographic Society.—(ESTABLISHED 1888.)—Meetings held at the Fitzroy Library, Lewes. *President*—G. J. Wightman. *Vice-President*—J. Tunks. *Committee*—E. T. Hall, W. E. Nicholson, E. L. Tippin, W. J. Young, C. A. Wells. *Secretary and Treasurer*—George Carpenter, 81 High Street, Lewes.

Lewisham Camera Club.—(ESTABLISHED 1890.)—Meetings held at the Lecture Hall, Lewisham High Road Congregational Church. *President*—B. Davidson. *Vice-Presidents*—C. J. Darling, Q.C., M.P., W. J. Dibdin, F.I.C., F.C.S., A. Haddon, Professor C. J. Lambert, M.A., F.R.A.S., A. H. Miles, M. Stoddart. *Committee*—F. R. Ball, W. C. Chaffey, C. Churchill, H. L. Davis, A. J. Dickinson, F.I.C. *Treasurer*—E. B. Eastwood. *Joint Hon. Secretaries*—E. Eastwood, 47 Tressillian Road, Brockley, S.E., and H. M. C. Sprunt, 192 New Cross Road, S.E.

Leytonstone Camera Club.—(ESTABLISHED 1891.)—Headquarters and Club Room, 414 High Road, Leytonstone. *President*—Dr. W. Pickett Turner. *Vice-Presidents*—E. W. Byrne, Q.C., M.P., A. Horsley Hinton, W. B. Whittingham, J.P., D. J. Morgan, J.P., Albert E. Bailey. *Council*—G. Campbell, G. E. Cox, G. H. Cricks, G. U. Haslam, M. D. Kerr, J. Prockter, F. W. Wates, A. Woodcock. *Librarian*—H. P. Hood. *Hon. Treasurer*—C. Andrews. *Hon. Secretary*—A. E. Bailey, Rose Bank, South West Road, Leytonstone. *Assistant Hon. Secretary and Lanternist*—C. A. Russell.

Lichfield Amateur Photographic Society.—(ESTABLISHED 1896.)—Meetings held at Mr. Tingle's Refreshment Rooms, Bird Street. *President*—E. M. Tingle. *Vice-President*—E. J. Smith. *Committee*—Messrs. Barnes, Sim, Grundy, Bates, Pinchers, and Key. *Secretary and Treasurer*—Albert E. Marshall, 7 Bird Street, Lichfield.

Light and Truth Postal Photographic Club.—(ESTABLISHED 1890.)—The objects of this Club are the mutual instruction and recreation of its members, by the circulation through the post of photographs produced by them, for criticism, exchange, &c., and also the discussion of photographic subjects. *Secretary and Treasurer*—Henry E. Trew, A.P.S., 139 Cheltenham Road, Bristol.

Lincoln Camera Club.—(ESTABLISHED 1892.)—Meetings held at the Lincoln School of Science and Art, Monks Road. *President*—The Right Hon. the Viscount St. Vincent. *Vice-Presidents*—Rev. Canon Fowler and Henry Mantle. *Committee*—A. Fieldsend, G. Howard, F. W. Key, G. Tuckwood, C. Watkin, F. Whattam, C. W. Witted. *Treasurer*—C. Nelson. *Secretary*—William E. Asquith, 24 Altham Terrace, St. Catherine's, Lincoln.

Liverpool Amateur Photographic Association.—(ESTABLISHED 1863.)—Meetings held at Percy Buildings, Eberle Street, Liverpool. *President*—J. Sirett Brown. *Vice-Presidents*—W. Prior Christian and Dr. J. W. Ellis, F.E.S. *Council*—A. J. Cleaver, H. Holt, H. Lupton, T. F. Lloyd, E. R. Dibdin, Alfred Tyrer, Paul Lange, F. Anyon, Rev. W. Smith, John H. Welch, G. B. Newton, E. V. Swinden, Joseph Earp, Dr. Llewellyn Morgan, E. L. Marriott. *Hon. Treasurer*—P. H. Phillips. *Hon. Secretary*—Frederick A. Schierwater, Percy Buildings, Eberle Street, Liverpool.

Liverpool Camera Club.—(ESTABLISHED 1891.)—Meetings held at 128A Mount Pleasant, Liverpool. *President*—R. W. Stumbles. *Vice-Presidents*—W. H. Griffiths and J. J. Clipsham. *Council*—J. Hawkins, J. Pride, W. W. Haywood, F. Gee, T. F. Carter, E. N. Ellis, H. Handley, H. G. Evans, T. Sanderson, J. Parish, F. V. A. Lloyd, J. Simpson. *Secretary and Treasurer*—W. Tansley, 14 Wentworth Street, Liverpool.

Liverpool Y.M.C.A. Camera Club.—(ESTABLISHED 1889.)—Meetings are held at the Central Y.M.C.A., 56 Mount Pleasant. *President*—W. P. Christian. *Vice-Presidents*—T. Jameson, J. F. Shone, John C. Lee. *Secretary and Treasurer*—E. C. Sanders, 144A Brownlow Hill, Liverpool.

Liverpool Physical Society (Photographic Section).—(ESTABLISHED 1891.)—Meetings are held at University College, Liverpool. *President*—W. E. Plummer. *Secretary*—Dr. C. A. Kohn, University College, Liverpool.

Llandudno Camera Club and Lantern Society.—(ESTABLISHED 1892.)—Meetings held at the Club House, Bodhyfryd Road, Llandudno. *President*—Right Hon. Lord Mostyn. *Vice-Presidents*—Dr. Dalton, Elias Jones, J.P., A. H. Hughes. *Committee*—Messrs. Campbell, Hughes Jones, Watterson, and Ashby. *Hon. Treasurer*—William Williams. *Hon. Secretary*—Ernest Deacon, Bodhypryd Road, Llandudno.

Longton and District Photographic Society.—(ESTABLISHED 1894.)—Meetings held at the Longton Endowed Schools. *President*—Dr. Griffiths. *Vice-Presidents*—T. P. Hulse and G. Hawley. *Committee*—E. Hallam, F. T. Holford, J. Bold, S. Jackson, R. Prince, E. H. Todd. *Treasurer*—S. Ashcroft. *Secretaries*—G. Turner, 19 Market Street, Longton, and T. Mottershead, Stafford Street, Longton.

London and Provincial Photographic Association.—(ESTABLISHED 1882.)—Meetings held at the White Swan, Tudor Street, Whitefriars. *Trustees*—A. Haddon and J. B. B. Wellington. *Committee*—Messrs. Bayston, R. Beckett, R. P. Drage, J. E. Hodd, J. S. Teape, E. J. Wall, and W. D. Welford. *Curator*—F. B. Grundy. *Recorder*—A. W. W. Bartlett. *Librarian*—H. C. Rapson. *Secretary and Treasurer*—Thomas E. Freshwater, F.R.M.S., F.R.P.S., 45 Torriano Avenue, Camden Road.

Loughborough Photographic Society.—(ESTABLISHED 1888.)—Meetings held at the Photographic Rooms, Church Gate. *President*—W. C. Burder. *Vice-Presidents*—A. D. Bartlett and G. Sillar. *Committee*—Messrs. Burder, Bartlett, Brotherton, Colgrove, Clarke, Hepworth, Kelsey Watson, and Yeomans. *Treasurer*—Henry Kelsey. *Secretaries*—H. Kelsey and W. Clarke, Cobden Street, Loughborough.

Louth and District Photographic Society.—(ESTABLISHED 1890.)—Meetings held at the Town Hall and at 8 Upgate, Louth, Lincolnshire. *President*—Rev. J. E. Standen. *Treasurer*—H. S. Forman. *Secretaries*—S. Francis Clarke, L.D.S., 8 Upgate, Louth, and Herbert C. Bentley, Apsley Villa, Grimsby Road, Louth, Lincolnshire.

Lyonsdown Amateur Photographic Society.—(ESTABLISHED 1886.)—Meetings held at members' houses. *President*—Frank Crosbie. *Treasurer*—Harold Imray. *Hon. Secretary*—Walter Crosbie, The Chestnuts, Lyonsdown, New Barnet.

Manchester Amateur Photographic Society.—(ESTABLISHED 1885.)—Meetings held at the Manchester Athenæum. *President*—Henry Sykes. *Vice-Presidents*—R. O. Gilmore, J. G. Jones, H. Smith, J. W. Wade. *General Committee*—E. Ashman, T. Morley Brook, F. W. Burton, S. L. Coulthurst, T. Glazebrook, J. W. Hadfield, G. E. Mellor, S. Searle, James Shaw, W. H. Shirley, George Wheeler, T. Widdop. *Sub-Committees*—Record: S. L. Coulthurst, R. O. Gilmore, J. W. Hadfield, W. H. Shirley, J. W. Wade, G. E. Mellor (Hon. Secretary); Society's Rooms and Demonstrations: T. Morley Brook, S. L. Coulthurst, T. Glazebrook, G. E. Mellor, S. Searle, James Shaw, H. Smith, George Wheeler, J. W. Young, E. Ashman (Hon. Secretary); Survey: T. Morley Brook, S. L. Coulthurst, C. Dawson, H. Smith; Lantern: F. W. Burton, J. G. Jones, F. W. Parrott, James Shaw, W. H. Shirley, J. W. Wade, T. Widdop, S. Searle (Hon. Secretary). *Librarian*—J. W. Young. *Editor of Magazine*—Henry Sykes. *Hon. Treasurer*—Charles Dawson. *Secretary*—F. W. Parrott.

Manchester Camera Club.—(ESTABLISHED 1885.)—Meetings are held at the Victoria Hotel, Manchester. *Committee*—J. Davenport, W. Hepburn, J. T. Foster, J. M. Wade, F. T. Overmann. *Treasurer*—J. Davenport. *Secretary*—C. Dawson, 66 Peter Street, Manchester.

Manchester Photographic Society.—(ESTABLISHED 1855.)—Meetings held at the Chamber of Commerce, 44 Mosley Street, Manchester. *President*—T. Chilton. *Vice-Presidents*—A. E. Casson, F. Edwards, W. Tomlinson, H. M. Whitefield, J. Wood. *Council*—T. M. Brook, J. Hyde, H. V. Lawes, F. W. Masters, J. Peddie, H. Wade, J. Whittaker, H. Woolley, J. C. Wolfenden, A. Heywood. *Treasurer*—W. G. Coote. *Secretary*—C. H. Coote, 10 Holmefield, Sale, near Manchester.

Manchester Y.M.C.A. Photographic Club.—(ESTABLISHED 1890.)—Meetings held at 56 Peter Street, Manchester. *President*—G. T. White. *Vice-President*—W. H. Newett. *Committee*—A. C. Harrison, J. Irvine, W. H. Machin, J. W. Price, W. H. Chatham, A. W. Pearson, F. H. Worsley, A. E. Wolstenholme. *Treasurer*—Irving Hume. *Secretary*—George Dixon, 56 Peter Street, Manchester.

Midland Camera Club.—(ESTABLISHED 1891.)—Meetings held at the Medical Institute, Edmund Street, Birmingham. *President*—H. R. Leech, M.R.C.S., J.P. *Vice Presidents*—Hall-Edwards, L.R.C.P., Councillor Lancaster, C. Jevons Fowler. *Council*—T. H. Cox, J. Donaghue, William Dudley, M.R.C.S., T. J. Perry, T. Smallwood. *Hon. Treasurer*—R. J. Bailey. *Hon. Secretary*—H. Cooper, 47 Hagley Road, Edgbaston.

Midlothian Camera Club.—(ESTABLISHED 1889, REORGANIZED 1893.)—Meetings held at the Philosophical Institution, Edinburgh. *President*—Alexander Calder. *Vice-President*—D. Bruce Peebles. *Council*—Alex. Thomson, Campbell Hossack, R. C. Ewart, David Frater, John Mackie. *Treasurer*—W. C. Callender. *Secretary*—A. D. Guthrie, Bonnington, Edinburgh.

Monklands Photographic Society.—(ESTABLISHED 1893.)—Meetings held at the New Free Library Buildings, Airdrie. *President*—Robert Dunlop. *Vice-President*—John W. Eadie. *Committee*—W. B. Hossack, J. Skeil, R. C. Platt, J. S. Lewis, Robert Adamson. *Treasurer*—Samuel H. Wood. *Secretary*—William Dixon Gray, 16 Bank Street, Airdrie.

Munster Camera Club.—(ESTABLISHED 1891.)—Meetings held at the School of Art, Nelson Place, Cork. *President*—K. B. Williams. *Vice-Presidents*—R. S. Baker, John Day, Ringrose Atkins, M.D., Major T. D. Lysaght, A.P.D., H. S. Noblett. *Committee*—W. R. Atkins, H. Schröter, J. McKechnie, E. Scott, C. H. Peame, H. Lunn, J. Bennett, John Day, J. Murphy, A. Roche, G. Percival, J. O'Connell. *Treasurer*—John Day. *Secretaries*—Ernest Scott and C. H. Pearne.

National Association of Professional Photographers of Great Britain and Ireland.—(ESTABLISHED 1891.)—Meetings are held in London, Birmingham, Leeds, Sheffield, and Edinburgh, as arranged by Council and notified to members. *President*—W. Barry (Hull). *Vice-Presidents*—J. Crosby (Rotherham), T. Fall (London), Chevalier Lafosse (Manchester), H. J. Whitlock (Birmingham). *Committee*—Harold Baker (Birmingham), W. Barry (Hull), T. Birtles (Warrington), Warwick Brooks (Manchester), J. Chancellor (Dublin), J. E. Eddison (Barnsley and Leeds), J. Fergus (Largs), — Guy (Cork), William Gill (Colchester), Richard Keene (Burton-on-Trent), T. W. Langton (Sheffield), Donald MacIver (Leeds), H. J. Mendelssohn (London), John Moffatt (Edinburgh), F. M. Whaley (Doncaster), G. V. Yas (Sheffield). *Auditors*—Harold Baker (Birmingham) and J. A. Draycott (Birmingham). *Hon. Treasurer*—W. Brookes (Manchester). *Hon. Secretary*—T. Bromwich (Kidderminster). *Secretary*—D. J. O'Neill, 47 Charlotte Road, Birmingham.

Newcastle upon-Tyne and Northern Counties' Photographic Association.—(ESTABLISHED 1881.)—Meetings held at the Art Gallery, Newcastle-on-Tyne. *President*—W. Parry. *Vice-Presidents*—J. S. B. Bell, J. Pattison Gibson, J. Hedley Robinson, John Watson. *Council*—Dr. Blacklock, W. E. Cowan, J. E. Goold, Wm. Graham, George Hall, J. J. Kirkwood, Edgar G. Lee, T. O. Mawson, Captain Sayers, G. L. Snowball. *Treasurer*—Frederick Park. *Secretary*—James Brown, 31 Market Street, Newcastle-on-Tyne. *Assistant Secretary*—Parker Brewis.

Newtownards Camera Club.—(ESTABLISHED 1894.)—Meetings are held at Regent Street Hall, Newtownards. *President*—Hugh Conway, B.A. *Vice-President*—S. H. Simms. *Committee*—Miss Jamison, Miss Johnston, — Paden, A. H. Moore, George Dickson. *Treasurer*—William McCullough. *Secretary*—Thomas Drake, Hardford Lodge, Newtownards.

Newton Heath Camera Club.—(ESTABLISHED 1893.)—Meetings are held at the Wesleyan School, Oldham Road. *President*—W. T. Evans. *Vice-Presidents*—R. Fallows and W. J. Cresswell. *Treasurer*—J. Moodie. *Secretary*—J. Fortune, 844 Oldham Road, Newton Heath.

Norfolk and Norwich Camera Club.—(ESTABLISHED 1886.)—Meetings held at the Bell Hotel, Norwich. *President*—The Rev. William Martin. *Vice-Presidents*—J. Algar and Dr. Thompson. *Committee*—Messrs. Davies, Latham, Bidwell, and Hyslop. *Secretary and Treasurer*—Colonel H. Wood, C.B., 63 Thorpe Road, Norwich.

Northamptonshire Natural History Society and Field Club (Photographic Section).—(ESTABLISHED 1876.)—Meetings held at the Society's Rooms, Dyechurch Lane. *President*—H. Manfield. *Secretary*—Joseph J. Wetherell, Billing Road, Northampton.

North Middlesex Photographic Society.—(ESTABLISHED 1886.)—Meetings held at Jubilee House, Hornsey Road, London, N. *President*—J. C. S. Mummery. *Vice-Presidents*—W. B. Goodwin and E. R. Mattocks. *Council*—J. Addison, R Child Bayley, A. J. Golding, C. O. Gregory, A. J. Johnson, A. H. Lisett, J. W. Marchant, J. McIntosh, F. L. Pither, C. R. Steele, H. Stuart. *Librarian*—F. W. Cox. *Treasurer*—H. Smith. *Secretary*—W. Taylor, 38 Palace Road, Hornsey, N. *Assistant Secretary and Curator*—W. J. Simpson.

North Staffordshire Photographic Society.—(ESTABLISHED 1889.)—Headquarters, Hanley Higher Grade Schools. *President*—E. B. Wain, M.I.C.E. *Vice-Presidents*—A. Shorter, William Hampton, Bernard Howson, A. E. Hils. *Council*—W. E. Leek, F. C. Powell, G. S. Turner, H. Lockett, H. B. Steele, H. A. Meigh, Dr. Prendergast. *Joint Hon. Secretaries*—W. H. Walley, Queen Street, Burslem, and J. W. Moore, Tontine Square, Hanley.

North Surrey Photographic Society.—(ESTABLISHED 1887.)—Meetings are held every alternate Tuesday at the Institute, Knight's Hill Road, West Norwood, S.E.

Nottingham Forest Camera Club.—(ESTABLISHED 1895.)—Meetings held at the Club Premises, Cornhill Street, Thyson Green, Nottingham. *President*—William Walker. *Vice-Presidents*—St. Leo Smith, F. Shumach, H. Dobbs, A. Mee. *Committee*—Messrs. Fox, Wheeldon, Blee, Henderson, and Steward. *Treasurer*—F. Coates. *Secretary*—William Slater, 202 Radford Road, Nottingham.

Oban Amateur Photographic Society.—(ESTABLISHED 1892.)—Place of Meeting, Oban. *President*—M. A. Scott. *Vice-President*—John Maclaine. *Committee*—President, Vice-President, Secretary and Treasurer, D. Campbell Munro, John Anderson, jun. *Hon. Secretary and Treasurer*—Samuel Lawrence, Chemist, Oban.

Oldham Photographic Society.—(ESTABLISHED 1867.)—Meetings held at the Lyceum, Union Street, Oldham. *President*—James Brooks. *Vice-President*—John Chadwick. *Committee*—John Greaves, jun., James Hall, Charles A. Hempstock, Tom Heywood, Bernard J. Holt, William A. Nash, Fred. Megson, John W. Cooper. *Treasurer*—J. Hilton Ashton. *Secretary*—Thomas Widdop, 17 Queen Street, Oldham.

Oxford Camera Club.—(Established 1894.)—Meetings held in the Oxford University Museum. *President*—Sir William J. Herschel, Bart., M.A. *Vice-Presidents*—Miss Acland, J. Andrews, M.A., Colonel E. C. Impey, E. A. Ryman-Hall. *Committee*—J. Minn, G. W. Norton, G. Shelton, J. B. Wilson, Dr. M. D. Stark, Miss Venables. *Treasurer*—R. A. R. Bennett, M.A. *Secretaries*—V. P. Sells, M.A., Highfield, Oxford, and H. A. Holliday, 17 Broad Street, Oxford.

Oxford University Photographic Society.—(Established 1882.)—Headquarters, 24 Friars Entry, Oxford.

Paisley Photographic Society.—(Established 1857, Reorganized 1885.)—Meetings held at 9 Gauze Street, Paisley. *Hon. Presidents*—H. H. Smiley and Stewart Clark. *Hon. Vice-Presidents*—Robert Harris, James Donald, jun., James Barr, A. F. McCallum. *President*—Edward Cook. *Vice-President*—Thomas Rastall. *Council*—D. B. Jack, F. Mathieson, J. Gibson, J. Mure, C. Glassford, M. M. Wright, J. McKinlay. *Treasurer*—D. B. Jack. *Joint Secretaries*—Robert McKinlay, Wallace Lea, Glasgow Road, Paisley, and Robert M. Alexander, 2 Gordon Place, Paisley.

Pennines Postal Photo Club.—(Established 1894.)—Portfolios circulate monthly. There is a Circulating Library, and a definite system of exchanges, also monthly note books and thorough mutual criticism. *Committee*—Mrs. F. Hunt, T. M. Brook, J. Gale, Dr. Richardson. *Secretary*—A. Champness, Sedbergh, Yorks.

Peterborough Photographic Society.—(Established 1887.)—*President*—George Kirkwood, M.D. *Vice-Presidents*—T. J. Walker, M.D., J.P., E. Worthington, G. W. Leigh. *Committee*—T. J. Calcutt, W. Pentney, J. F. Perkins, J. T. Scotney, A. C. Taylor. *Treasurer*—W. Atkinson. *Secretary*—A. W. Nicholls, 11 Cromwell Road, Peterborough.

Photographic Club.—(Established 1879.)—Meetings held at Anderton's Hotel, Fleet Street, London, E.C. *Trustees*—Frank Haes and Alexander Cowan. *Committee*—E. Crofton, R. P. Drage, E. W. Foxlee, A. Mackie, E. A. Newell, W. D. Welford, J. B. B. Wellington, J. R. Williams. *Recorder*—S. H. Fry. *Curator and Librarian*—C. Wallis. *Secretary and Treasurer*—F. A. Bridge, East Lodge, Dalston Lane, London, N.E.

Photographic Salon.—(Established 1892.)—Meetings held at the Dudley Gallery, Egyptian Hall, Piccadilly, W. *Committee*—A. Alexandre, Bernard Alfieri, J. Craig Annan, Ernest R. Ashton, Lionel C. Bennett, J. S. Bergheim, Shapoor N. Bhedwar, Valentine Blanchard, Rowland Briant, Tom Bright, T. M. Brownrigg, Maurice Bucquet, Arthur Burchett, A. Buschbek, W. A. Cadby, Eustace Calland, H. Hay Cameron, Lyonel Clark, Francis Cobb, Lewis Cohen, Hector Colard, Walter L. Colls, Reginald W. Craigie, William Crooke, L. David, Henry E. Davis, George Davison, S. Day, Robert Demachy, R. Eickemeyer, Charles Emanuel, J. Gale, John Pattison Gibson, Karl Greger, J. C. M. Grove, Hugo Henneberg, A. Hildesheimer, Alfred Horsley Hinton, Frederick Hollyer, Heinrich Kühn, George H. James, Rouillé Ladevèze, Rev. F. C. Lambert, Baron Alfred Liebieg, Thomas Manly, Alfred Maskell, C. Puyo, H. P. Robinson, Ralph Robinson, Baron N. de Rothschild, Lyddell Sawyer, Otto Scharf, Alfred Stieglitz, J. Strakosch, Frank M. Sutcliffe, Carl Ulrich, Hans Watsek, J. B. B. Wellington, H. Van der Weyde, B. Gay Wilkinson, jun., W. Willis. *Hon. Secretary*—Alfred Maskell, Dudley Gallery, Piccadilly, W.

Photographic Convention of the United Kingdom.—(ESTABLISHED 1886.)—Meeting at Great Yarmouth in July, 1897, under the Presidency of F. P. Cembrano. Retiring President (Leeds, 1896), H. P. Robinson. The Photographic Convention was established in 1886 for the advancement of photography, and to afford opportunities for personal intercourse and exchange of ideas amongst those interested in the art, from all parts of the United Kingdom. The Council of the Convention is empowered to make grants from the surplus funds under its control, in aid of photographic research. Meetings have been held at the following centres:—Leeds, Shrewsbury, Dublin, Plymouth, Edinburgh, Bath, Chester, London, Birmingham, Glasgow, Derby. *Past Presidents*—A. Haddon, Sir Howard Grubb, George Mason, William Bedford, George Davison, C. H. Bothamley, Andrew Pringle, J. Traill Taylor. *Former Hon. Secretaries*—J. J. Briginshaw and F. P. Cembrano. *Council*—Sir Howard Grubb, E. J. Appleby, Godfrey Bingley, Thomas Bedding, C. H. Bothamley, J. J. Briginshaw, F. A. Bridge, F. P. Cembrano, Alexander Cowan, W. Crooke, Herbert Denison, A. Haddon, Martin J. Harding, H. M. Hastings, A. Horsley Hinton, Paul Lange, C. Phipps Lucas, Percy Lund, J. L. Lyell, Major Lysaght, George Mason, Thomas Mayne, A. F. Mowll, W. W. Naunton, J. Porritt, Andrew Pringle, J. C. Ruthven, A. Seaman, John Stuart, Henry Sturmey, W. Taylor, Alexander Tate, E. J. Wall, J. H. Walker, H. Snowden Ward, G. Watmough Webster, S. B. Webber, W. D. Welford, J. B. B. Wellington, F. W. Williams, A. Werner. *Trustees*—S. B. Webber and R. P. Drage. *Auditors*—Thomas Fall and John Howson. *Hon. Secretary and Treasurer*—R. Poulter Drage, 95 Blenheim Crescent, London, W.

Photographic Copyright Union.—*President*—Frank Bishop. *Vice-President*—Joseph J. Elliott. *Committee*—J. Lillie Mitchell, Hon. Secretary (London Stereoscopic Co.); William Downey (W. & D. Downey), London; Alfred Ellis, London; E. Frith, Reigate; James Lafayette, Dublin; Louis Wilson (G. W. Wilson & Co., Ltd.), Aberdeen; Frank M. Sutcliffe, Whitby; W. Mayrath (Guy & Co.), Cork and Limerick; Warwick Brookes, Manchester. *Treasurer*—William Grove, London. *Secretary*—Henry Gower, London Chamber of Commerce, Eastcheap, London, E.C.

Photographic Society of Ireland.—(ESTABLISHED 1854.)—Meetings held at 35 Dawson Street, Dublin. *President*—Alfred Werner, F.R.P.S. *Past Presidents*—Sir Howard Grubb, F.R.S., George Mansfield, J.P., J. Alfred Scott, M.D., F.R.C.S.I. *Vice-Presidents*—Leonard R. Strangways, M.A., and J. A. C. Ruthven, A.M.I.C.E.I. *Council*—J. H. Hargrave, B.A., James Simpson, H. Goodwillie, A. M. Geddis, R. M. Inglis, J. M. Keogh, J. Armstrong, G. E. Mathews, J. H. Gane. *Hon. Treasurer*—William Bewley, B.A. *Hon. Secretary*—Victor E. Smyth, 7 Uxbridge Terrace, Dartmouth Road, Ranelagh, Dublin. *Assistant Secretary*—W. F. Cooper, 194 Clonliffe Road, Drumcondra, Dublin.

Photographic Survey of Warwickshire.—(ESTABLISHED 1891.)—Meetings held at Birmingham. *President*—Sir J. B. Stone, M.P. *Vice-President*—Jethro A. Cossins. *Treasurer*—G. F. Lyndon, J.P. *Secretary*—J. H. Pickard, Southfield, Priory Road, Edgbaston, Birmingham.

Plymouth Photographic Society.—(ESTABLISHED 1895.)—Meetings held at the Mechanics' Institute, Plymouth. *President*—E. H. Micklewood. *Vice Presidents*—H. S Hill and Aver Duncan. *Committee*—F. E. Bowden, W. H. Harris, T. Algate, J. Hayne-Pillar, J. D. Turney. *Auditor*—F. Johnson. *Hon. Treasurer*—Thomas Stanning. *Hon. Secretary*—R. Rugg Monk, 4 Frankfort Street, Plymouth.

Plympton Photographic Society.—(ESTABLISHED 1893.)—*President*—Dr. Aldridge. *Council*—Dr. Ellery, E. Dudley, H. Tritton, C. H. Stevens. *Secretary and Treasurer*—T. H. Wilks, Plympton House, Plympton, Devon.

Postal Camera Club.—(ESTABLISHED 1894.)—A circulating Club for the criticism of prints by members, and mutual aid on matters photographic. The portfolios (of which there are three) circulate regularly. Prints are inserted and withdrawn by the members as the portfolio receives them monthly. *Hon. Secretary*—W. R. Bland, Duffield, Derby.

Postal Photographic Club.—(ESTABLISHED 1886.)—Headquarters, Walton Manor Lodge, Oxford. Formed for the circulation and exchange of prints, and discussions on various matters of photographic interest. Criticisms are made on the prints circulating by the members. Prints are inserted by members as the cases reach them (about once a month). *Secretary and Treasurer*—Reginald A. R. Bennett, M.A. (Oxon.), Walton Manor Lodge, Oxford.

Postal Photographic Competition Club.—(ESTABLISHED 1893.)—Monthly circulation of pictures. Advanced workers in pictorial photography eligible for admission only. *Secretary*—Hugo Meynell, Farley, Cheadle, Stoke-on-Trent.

Preston Scientific Society (Photographic Section).—Meetings held at the Guildhall. *President*—Richard Wilding, F.R.A.S. *Chairman of Section*—Henry Atherton. *Secretary and Treasurer*—Frank Ketton, Oak Cottage, Fulwood, Preston.

Putney Photographic Society.—(ESTABLISHED 1890.)—Meetings are held at Chelverton Hall, Putney. *President*—The Hon. Baron Pollock. *Vice-Presidents*—John A. Hodges, F.R.P.S., H. Kimber, M.P., Dr. W. J. Sheppard. *Council*—F. Chasemore, Dr. J. F. Farrar, H. Faulkner, T. Gilbert, W. F. Gorin, William Martin, W. C. Plank, Dr. C. Wyman, L. S. Zachariasen. *Secretary and Treasurer*—William Martin, 4 Lower Parkfields, Putney, S.W.

Ramsgate Camera Club.—(ESTABLISHED 1894.)—Meetings are held at the Victoria Hotel, Hardres Street, Ramsgate. *President*—George R. Tweedie, J.P., F.C.S. *Vice-Presidents*—Ernest E. Wastall, J.P., and W. T. Davey. *Committee*—Messrs. Dutton, Vigar, Lambert, Kingsland, Adams, Vickery, Fa'cy, Hoile, Bear, and Smith. *Treasurer*—Robert J. Smith. *Joint Hon. Secretaries*—Henry G. Holloway, jun., and Robert J. Smith, Faversham Villa, Southwood, Ramsgate.

Reading Y.M.C.A. Camera Club.—(ESTABLISHED 1894.)—Meetings are held at Valpy Street, Reading. Under control of Y.M.C.A. Executive Committee. *Secretary and Treasurer*—Henry A. Churchill, Y.M.C.A., Valpy Street, Reading.

Redditch Institute (Photographic Section) (late Redditch Amateur Photographic Society).—Meetings are held at the Redditch Institute. *Chairman*—H. Page, M.D. *Hon. Secretary*—Alfred Parr, Beoley.

Richmond Camera Club.—(ESTABLISHED 1890.)—Meetings held at the Greyhound Hotel, Richmond, Surrey. *President*—F. P. Cembrano, jun. *Vice-Presidents*—E. D. Purcell and G. Ardaseer. *Committee*—J. H. Alabaster, C. J. M. Child, J. D. Gibson, J. W. St. John Hunt, G. O. Richards. *Treasurer*—J. B. Huddy. *Secretary*—C. H. Davis, 97 Church Road, Richmond, Surrey.

Rochdale and District Photographic Society.—(ESTABLISHED 1890.)—*President*—J. A. Bright. *Vice-Presidents*—Alderman J. R. Heape, Colonel C. M. Royds, M.P., C. Fairbank, F. W. Turner, R. M. Jones, Rev. T. P. Spedding. *Committee*—F. Greenwood, J. H. Whiteley, O. S. Bateson, R. Whitehead, J. W. Woolfenden, E. H. Seanor, G. A. Close, J. Beck, D. E. Brooks, G. Smith. *Treasurer*—R. J. Mills. *Secretaries*—H. & W. Bamford, 242 Yorkshire Street, Rochdale.

Rochester Naturalists' Club (Photographic Section).—(ESTABLISHED 1892.)—Meetings held at the Mathematical School, Rochester.

Rock Ferry Camera Club.—(ESTABLISHED 1894.)—Meetings are held at St. Peter's Hall, Rock Ferry. *President*—S. Cross. *Vice-President*—Dr. E. R. W. Spratley. *Committee*—C. Sunderland, C. Hill, A. Jenkins, Mrs. Journeay, Miss E. Cross. *Treasurer*—R. G. Armstrong. *Secretary*—John W. Kelly, Egerton Park, Rock Ferry.

Rodley Photographic Society.—(ESTABLISHED 1894.)—Meetings are held at members' houses. *President*—Mr. Broughton. *Secretary and Treasurer*—H. Crossley, Rodley, near Leeds.

Romford and District Photographic Society.—(ESTABLISHED 1894.)—Meetings held at High Street, Romford. *President*—W. E. Gibb, J.P. *Vice-President*—A. Money Wigram, M.P. *Committee*—R. T. Aldous, C. G. Church, T. J. Doy, C. Hussey, A. G. Lucas, C. S. March, E. A. Michell, O. L. Puckle, C. G. Reed, W. J. Slaughter. *Hon. Treasurer*—J. W. Lasham. *Hon. Secretary*—A. J. Ormiston, 4 Laurie Square, Romford.

Rossendale Camera Club.—(ESTABLISHED 1894.)—Meetings held at the Blue Ribbon Club, Rawtenstall. *President*—A. F. Stanesby. *Vice-Presidents*—W. T. Entwisle and J. Taylor. *Committee*—T. H. Yardley, S. Simpson, L. Poynton, W. H. Booth, P. Stevens. *Treasurer*—J. Butterworth. *Secretary*—A. Thickett, 88 Bank Street, Rawtenstall. *Secretary for Crawshawbooth*—W. H. Booth, Minor Street.

Rotherham Photographic Society.—(ESTABLISHED 1889.)—Meetings held at 5 Frederick Street, or Mechanics' Institute, Rotherham. *President*—Dr. F. B. Judge Baldwin. *Vice-Presidents*—E. Isle Hubbard, G. T. M. Rackstraw, J. Leadbeater. *Council*—The Officers, and W. Mason, J. Clarke, R. H. Law, J. Turner, C. E. Parkin, jun. *Treasurer*—A. S. Lyth. *Secretary*—Henry C. Hemmingway, 6 Stanley Street, Rotherham.

Royal Cornwall Polytechnic Society.—(ESTABLISHED 1833).—Meetings held at Falmouth. *President*—T. Bedford Bolitho, M.P. *Vice-Presidents*—Right Hon. Viscount Falmouth, E. W. Bailey, F.E.S., F.L.S., J. D. Enys, F.G.S., J. Passmore Edwards, Professor T. E. Thorpe, F.R.S., J. Bevill Fortescue, William Brooks, John Stephens, M. H. Williams, Stanhope Forbes, A.R.A., John J. Beringer, F.C.S., George H. Fox. *Treasurer*—R. Milford Tweedy. *Secretary*—Edward Kitto, F.R.Met.S., The Observatory, Falmouth.

Royal Photographic Society.—(ESTABLISHED 1853.)—Meetings are held at 12 Hanover Square, London, W. *President*—Captain W. de W. Abney, C.B., R.E., D.C.L., F.R.S. *Vice-Presidents*—The Right Hon. the Earl of Crawford, K.T., F.R.S., T. R. Dallmeyer, F.R.A.S., J. W. Swan, M.A., F.R.S., Sir H. Trueman Wood, M.A. *Council*—T. Bedding, T. Bolas, F.I.C., F.C.S., F. A. Bridge, J. Cadett, F. P. Cembrano, jun., A. Cowan, W. E. Debenham, Colonel J. Gale, T. C. Hepworth, F.C.S., E. Cecil Herstlet, F. Hollyer, A. Mackie, J. W. Marchant, J. A. Sinclair, J. Spiller, F.I.C., F.C.S., E. J. Wall, Leon Warnerke, Paul L. Waterlow, Horace Wilmer. *Treasurer*—George Scamell. *Secretary*—Chapman Jones, F.I.C., F.C.S., 11 Eaton Rise, Ealing, W. *Assistant Secretary*—R. Child Bayley, 12 Hanover Square, London, W.

Scarborough and District Photographic Society.—(ESTABLISHED 1892.)—Meetings held at the Museum, Scarborough. *President*—Rev. W. Tofield Reeder, M.A. *Committee*—Dr. F. Dales, Miss M. McCallum, J. G. Megginson, J. Cordukes Thompson, Mrs. L. G. Turner, J. Whitfield. *Treasurer*—J. B. Spicer. *Secretary*—J. H. Rowntree, Westwood, Scarborough.

Selby Camera Club.—(ESTABLISHED 1890.)—Place of Meeting and Dark Rooms, Park Street. *President*—William Rawling. *Vice-Presidents*—J. T. Atkinson and J. C. Thompson. *Committee*—W. J. Allison, T. R. Cooper, E. Reasbeck, J. Morley. *Secretary and Treasurer*—W. N. Cheesman, The Crescent, Selby.

Shaw Church Institute Photographic and Art Society.—(ESTABLISHED 1888.)—Meetings held at the Shaw Church Institute. *President*—J. H. Broadbelt. *Vice-President*—J. R. Royds. *Committee*—J. Watson, T. Mitchell, H. Rhodes. *Secretary and Treasurer*—John Maiden, 91 Rochdale Road, Shaw, near Oldham.

Sheerness Camera Club.—(ESTABLISHED 1896.)—Meetings held at the Club Room, 3 Russell Street. *President*—J. J. King-Salter. *Vice-President*—J. Small. *Committee*—Messrs. Shutt, Ingram, and Flynn. *Treasurer*—A. Hughes. *Secretary*—E. J. White, 94 Invicta Road, Sheerness.

Sheffield and Hallamshire Photographic Society.—(ESTABLISHED 1896.)—Meetings are held at the Crown and Anchor Hotel, Fitzwilliam Street, Sheffield. *President*—L. Britton. *Vice-President*—G. H. Bagshaw. *Committee*—Messrs. Mulholland, Cartledge, Pashley, Heathcote, Evans, Birch, Cunningham, and Oates. *Treasurer*—J. W. Mottershaw. *Secretary*—F. Lowe, 361 Sharrow Vale Road.

Sheffield Optical Lantern Society.—(ESTABLISHED 1890.)—Meetings held at St. Paul's Schools, Cambridge Street, Sheffield. *President*—Dr. J. A. Manton. *Vice-Presidents*—Alderman W. R. Carter, A. Nicholson, H. Staniforth, J. W. Wilson. *Committee*—Miss Roberts, Messrs. Allen, Blyde, Carr, Cunningham, R. Glenn, J. E. Glenn, S. Hughes, and E. Thornhill. *Reporter*—J. S. Stephens. *Hon. Treasurer*—E. Copley. *Hon. Secretary*—J. Clowes, 30 Bolsover Street, Sheffield. *Assistant Secretary*—J. H. Lygo.

Sheffield Photographic Society.—(ESTABLISHED 1875.)—Meetings are held at the Masonic Hall, Surrey Street, Sheffield. *President*—G. Tomlinson. *Vice-Presidents*—B. Nowill, E. Beck, T. Firth. *Council*—D. C. Brooks, W. T. Furniss, T. G. Hibbert, E. H. Pearce, S. Camp. *Reporter*—George W. Blackwell. *Treasurer*—Joseph Smith. *Secretary*—Herbert Ellis, Falmouth Villa, Meersbrook Park Road, Sheffield.

Society for the Encouragement of Arts, Manufactures, and Commerce.—(FOUNDED IN 1754. INCORPORATED BY ROYAL CHARTER IN 1847.)—Meetings are held in John Street, Adelphi, London, W.C. *Council*—H.R.H. the Prince of Wales, K.G. (President of the Society), Major-General Sir Owen Tudor Burne, K.C.S.I., C.I.E. (Chairman of the Council), H.R.H. the Duke of Saxe Coburg and Gotha, K.G. (Vice-President), H.R.H. the Duke of York, K.G. (Vice-President), Sir Frederick Abel, Bart., K.C.B., D.C.L., F.R.S. (Vice-President), Duke of Abercorn, K.G., C.B. (Vice-President), Captain W. de W. Abney, R.E., C.B., F.R.S. (Vice-President), William Anderson, C.B., D.C.L., F.R.S. (Vice-President), The Attorney-General, G.C.M.G., Q.C., M.P. (Vice-President), Sir Steuart Colvin Bayley, K.C.S.I., C.I.E., John Wolfe Barry, C.B., F.R.S., Lord Belhaven and Stenton, Sir George Birdwood, K.C.I.E., C.S.I., LL.D., M.D. (Vice-President), Sir Edward Birkbeck, Bart. (Vice-President), Sir Courtenay Boyle, K.C.B. (Vice-President), Sir Frederick Bramwell, Bart., D.C.L., F.R.S. (Vice-President), George Ledgard Bristow, R. Brudenell Carter, F.R.C.S., B. Francis Cobb (Treasurer), Right Hon. Viscount Cross, G.C.B. (Vice-President), Right Hon. George N. Curzon, M.P. (Vice-President), Hon. Sir Charles W. Fremantle, K.C.B. (Vice-President), Sir Douglas Galton, K.C.B., D.C.L., F.R.S. (Vice-President), Joseph G. Gordon, Henry Graham Harris, Lord Kelvin, F.R.S. (Vice-President), Sir Charles Malcolm Kennedy, K.C.M.G., C.B. (Vice-President), Sir Stuart Knill, Bart., Alderman (Vice-President), The Lord Chancellor (Vice-President), James Sewell Neville, Sir Westby B. Perceval, K.C.M.G., William Henry Preece, C.B., F.R.S. (Vice-President), Sir Owen Roberts, M.A., D.C.L., F.S.A. (Treasurer), Professor William Chandler Roberts-Austen, C.B., F.R.S. (Vice-President), Earl of Rosebery, K.G., K.T. (Vice-President), Sir Saul Samuel, K.C.M.G., C.B. (Vice-President), Alexander Siemens, Professor John Millar Thomson. *Auditors*—J. O. Chadwick and Son. *Accountant*—Howard H. Room. *Secretary*—Sir Henry Trueman Wood, M.A. *Assistant Secretary*—Henry B. Wheatley, F.S.A.

Shields and District Camera Club.—(ESTABLISHED 1893.)—Meetings held at the Studio, Albion Road, North Shields. *President*—Edward Godfrey. *Vice-Presidents*—Miss Phillips, A. Surtics, R. W. Tate. *Committee*—R. Newham, J. Guy, W. Bell, A. G. Johnston. *Secretary and Treasurer*—William S. Irvin, Bedford House, North Shields.

Shropshire Camera Club.—(ESTABLISHED 1886.)—Meetings held at Castle Chambers, Castle Street, Shrewsbury. *President*—W. E. Harding. *Vice-Presidents*—M. J. Harding, W. D. Haydon, F. W. Williams. *Council*—W. Alltree, W. Bowdler, F. R. Armytage, M.A., R. J. Irwin, C. W. Ebrall, P. W. Pilcher, M.A. *Hon. Treasurer*—W. Heath. *Hon. Secretary*—J. L. Della Porta.

Smethwick and District Photographic Society.—(ESTABLISHED 1895.)—Meetings held at the Hill Street Schools, Smethwick. *President*—Dr. J. Pitt. *Committee*—F. Read, — Gregory, A. Jeffery, G. Lee, W. Howlett. *Treasurer*—Mr. Grant. *Secretary*—A. Highfield, 63 Regent Street, Smethwick.

South London Photographic Society.—(ESTABLISHED 1888.)—Meetings held at Hanover Hall, Hanover Park, Peckham, S.E. Affiliated to the Royal Photographic Society. *Patron*—His Grace the Duke of Newcastle. *President*—F. W. Edwards, F.R.P.S. *Vice-Presidents*—S. W. Gardner, Maurice Howell, Dr. T. G. Munyard, W. Rice, F.E.I.S., W. F. Slater. *Committee*—M. Boxall, W. C. Boyce, C. F. Dickinson, H. Esler, A. Fellows, F. W. Grigg, B. Lyon, G. A. Maull, W. D. Welford. *Curator*—G. H. Moss. *Hon. Lanternist*—J. T. French. *Delegates to the Affiliation of Photographic Societies*—Charles H. Oakden and W. D. Welford. *Hon. Treasurer*—A. E. Whitby. *Hon. Secretary*—Charles H. Oakden, 30 Henslowe Road, East Dulwich, S.E. *Hon. Assistant and Excursion Secretary*—A. E. Allen, 27 Princes Square, Kennington, S.E.

Southport Social Photographic Club.—(ESTABLISHED 1890.)—Meetings are held at The Studios, 15 Cambridge Arcade. *President*—D. E. Benson, Assoc. M.Inst.C.E. *Vice-Presidents*—J. S, Dickin, L.D.S., and S. Tordoff, L.R.C.P. *Committee*—H. L. Hawksley, L.R.C.P., C. F. Depree, W. P. Brown, H. J. Heaton, T. Ormrod. *Treasurer*—J. R. Cave, A.P.S. *Secretary*—George Cross, 15 Cambridge Arcade, Southport.

Southsea Amateur Photographic Society.—(ESTABLISHED 1888.)—Meetings held at 5 Pembroke Road, Portsmouth. *President*—Colonel H. W. B. Bruno. *Vice-President*—A. Fisher, A.S.A. *Committee*—Colonel C. Wilkinson, R.E., F.R.P.S., F. W. Fox, M.A., C. H. Grant, G. Whitefield. *Treasurer*—Dr. F. Lord. *Secretary*—H. T. Lilley, M.A., 22 Pelham Road, Southsea.

Spalding and District Photographic Society.—ESTABLISHED 1894.)—Meetings are held at the Christian Association, Spalding. *President*—W. A. Southwell. *Vice-Presidents*—Rev. R. G. Ash and G. F. Barrell. *Committee*—A. K. Maples, H. B. Massey, T. Bloodworth. *Secretary and Treasurer*—E. Wightman Bell, High Bridge, Spalding.

Stafford Y.M.C A. Photographic Society.—Meetings held at the Y.M.C.A. Rooms, Gaol Square. *President* H. E. Burn. *Vice-President*—H. Cliff. *Committee*—M. Averill, W. Kirkham, W. H. Rostance, G. Wray, R. W. Hourd. *Hon. Auditors*—E. H. Neighbour and H. D. Jones. *Hon. Treasurer and Secretary*—F. Cliff, 11 Gaolgate Street, Stafford.

St. Bartholomew's Hospital Photographic Society.—(Established 1886.)—Meetings held at St. Bartholomew's Hospital. *President*—Dr. W. J. Russell, F.R.S. *Vice-Presidents*—F. Womack, M.B., and Dr. Lewis Jones, F.R.C.P. *Committee*—J. Hussey, M.R.C.S., M. Coleman, M.R.C.S , G. Crace Calvert, M.B. *Secretary and Treasurer*—T. J. Horder, B.Sc., M.R.C.S., St. Bartholomew's Hospital, London, E.C.

Stereoscopic Club.—(Established 1890.)—Meetings held at Brooklands. *President*—James Whiteligg. *Treasurer*—F. Hallawell. *Secretary*—W. I. Chadwick, F.R.P.S., Westwood, Sale, Cheshire.

Stereoscopic Society.—(Established 1893.)—*President*—W. W. Stainthorpe, M.D., J.P. *Viee-President*—Ringrose Atkins, M.A., M.D. *Secretary and Treasurer*—B. Diveri, B.A., Huntly, N.B.

St. Helens and District Photographic Society.—(Established 1894.)—Headquarters, Wolverhampton House, Church Street, St. Helens. *Vice-Presidents*—Colonel Gamble, C.B., D. McKechnie, J.P., F. R. Dixon-Nuttall, J.P., R. G. Brook, W. Thomason, C. H. Jolliffe, Rev. J. W. Willink. *Council*—J. Cammack, L West, J. Westworth, J. G. Wallbridge, W. W. Gandy, A. M. Booth, D. Thomason, J. C. Nicol. *Hon. Secretary and Treasurer*—James Critchley, Gamble Institute, St. Helens, Lancashire.

Stockport Photographic Society.—(Established 1889.)—Meetings held at the Mechanics' Institute. *President*—Colonel Turner, J.P. *Vice-Presidents*—George Hidderley, E. F. Ward, Edward Johnson. *Council*—A. M. Gourley, J. W. Buckley, T. Bedford, W. A. Downham, T. Allott, J. Lingard, W. B. Leigh, J. G. Howarth, J. C. Arnfield, J. Rushton. *Treasurer*—O. Coppock. *Joint Secretaries*—T. Gould and George Hidderley, 104 Chestergate, Stockport.

Stockton-on-Tees Photographic Society.—(Established 1887.)—*President*—William S. Fothergill. *Vice-Presidents*—W. Downs and H. Bradley. *Council*—J. Bowron, J. H. Draper, W. K. Hunton, J. H. Jackson, W. W. Stainthorpe, M.D., Thomas Watson, M.D. *Treasurer*—J. H. Rhodes. *Secretary*—W. S. Fothergill, Hartburn, Stockton-on-Tees.

St. Peter's Park, Paddington, Photographic Society.—(Established 1894.)—Meetings held at the St. Peter's Institute, Chippenham Road, Paddington. *President*—Rev. James White. *Treasurer*—E. R. Marsh. *Secretary*—F. Mann, 48 Elgin Avenue, London, W.

Streatham Photographic Society.—(ESTABLISHED 1895.)—Meetings held at Headquarters, 14 Greyhound Lane, Streatham, S.W. *President*—E. Gordon Hull, M.D. *Vice-President*—J. D. B. Lewis. *Lanternist*—H. G. Coombs. *Librarian*—G. Comins. *Treasurer*—S. E. Pollard. *Hon. Secretary*—J. J. Laws, Chemist, Streatham Common, S.W. *Assistant Secretary*—A. W. James.

Stroud Photographic Society.—(ESTABLISHED 1895.)—Meetings are held at the School of Art, Stroud. *President*—W. J. Paley Marling, M.A. *Vice-President*—W. H. C. Fisher, C.E. *Committee*—F. Avens, T. Lay-Fairweather, W. H. C. Fisher, G. T. Nichols, W. Ridler, R. Sykes, T. Turnell. *Secretary and Treasurer*—Thomas Hackwood, F.R.C.O., Belsize Villa, Stroud, Gloucestershire.

Sun & Company.—(ESTABLISHED 1886.)—A Postal Photographic Society, limited to forty amateurs, for the monthly circulation and criticism of photographs, entirely the work of members, and for a general interchange of ideas, with a view to mutual advancement in the science and art of photography. *Committee*—F. de Paula, Wallace Heath, F. W. Williams, and the Hon. Secretary. Application for vacancies should be made to the Hon. Secretary, Martin J. Harding, 6 Havelock Road, Shrewsbury.

Sunbeam Portfolio Club.—(ESTABLISHED 1892.)—*Committee*—James Simkins, W. H. Whittard, A. H. Hughes. *Secretary*—A. H. Hughes, Rochester House, Llandudno, North Wales.

Sunbeam Postal Photographic Club.—(ESTABLISHED 1894.)—*Secretary and Treasurer*—J. T. Pattison, Fawley Lodge, South Woodford, Essex.

Sunderland Photographic Association.—(ESTABLISHED 1888.)—*President*—W. Milburn. *Vice-Presidents*—J. Lynn and W. Pratt. *Council*—G. Bartram, A. C. Boulton, J. W. Broderick, W. Horan, E. R. Kirkley, W. J. Pearson, A. Peddie, W. J. Pope. *Hon. Treasurer*—T. Walton. *Hon. Secretary*—Charles E. Cowper, 21 Holmeside, Sunderland.

Sutton Coldfield Camera Club.—(ESTABLISHED 1889.)—Meetings held at the Town Hall, Sutton Coldfield, Warwickshire. *President*—H. Duncalfe, M.R.C.S., J.P. *Vice-Presidents*—S. A. Taylor, G. H. Dugard, M. H. Highway. *Committee*—H. Billson, C. J. Fowler, T. S. Hooper, G. L. Price, T. H. Purden. *Treasurer*—G. Parker. *Secretary*—Henry Rabnett, Hartopp Cottage, Four Oaks, Sutton Coldfield.

Sutton Scientific and Literary Society (Photographic Section).—(ESTABLISHED 1886.)—Meetings held at Public Hall Chambers, Sutton, Surrey, on the first Tuesday in each month. *Chairman*—E. de Clifford. *Committee*—F. S. Cripps, W. Goode, Mrs. Culverhouse. *Recorder*—A. P. Hoole, The Willows, Sutton, Surrey.

Talbot Album Club.—(ESTABLISHED 1886.)—*Secretary*—Frederick H. Davies, Shustoke, Birmingham.

The Park Photographic Society.—(ESTABLISHED 1894.)—Meetings held at the Domestic Mission, Mill Street, Dingle, Liverpool. *President*—T. Lee Lloyd. *Vice-Presidents*—Dr. Foulston and R. Coventry. *Treasurer*—Edward Warwick. *Secretary*—Alexander Mair, 337 Grafton Street, Liverpool.

Todmorden Photographic Society.—(ESTABLISHED 1892.)—Meetings held at the Society's Rooms, Burnley Road. *President*—William Ormorod. *Vice-Presidents*—William Lord, Rev. E. J. Russell, J. Holt. *Council*—W. E. Shackleton and W. Fairbourn. *Treasurer*—Rev. E. Parry. *Secretary*—William Snowden, 14 Stansfield Street, Todmorden.

Trowbridge and District Photographic Society.—(ESTABLISHED 1893.)—Meetings held at the Market Place, Trowbridge. *Committee*—Rev. W. H. Start, A. F. Wilkins, J. H. Aplin, G. Lansdown, A. J. Cogswell, T. A. Dring. *Secretary and Treasurer*—R. H. Foley, The Halve, Trowbridge, Wiltshire.

Tunbridge Wells Amateur Photographic Association.—(ESTABLISHED 1887.) Meetings held at the Mechanics' Institute. *Patron*—Sir David Salomons, Bart. *President*—Francis G. Smart, M.A. *Vice-Presidents*—Rev. A. T. Scott, M.A., E. R. Ashton, George Lewis, C. Leeson Prince, F.R.A.S., F.R.Met.S. *Committee*—A. W. Pierson, J. W. Morgan, G. W. Howard. *Treasurer*—B. Whitrow. *Secretary*—Joseph Chamberlain, 14 Calverley Park Gardens.

Tyneside Camera Club.—(RE-FORMED 1896.)—Meetings held at 50 Waller Street, Byker. *President*—J. Brown. *Secretary*—Jos. F. McKie, 50 Waller Street, Byker, Newcastle-upon-Tyne.

Ulster Amateur Photographic Society.—(ESTABLISHED 1886.)—Meetings held at the Museum, College Square North, Belfast. *President*—William Gray, M.R.I.A., F.R.S., &c. *Vice-Presidents*—John Brown, W. Redfern Kelly, F.R.A.S., &c., Professor Letts, Ph.D., &c., Cecil E. Shaw, M.A., M.D., James Stelfox, Alexander Tate, C.E. *Committee*—J. J. Andrew, L.D.S., F. J. Brill, J. H. Greenhill, James Leslie, James M'Cleery, W. E. Williames. *Treasurer and Corresponding Secretary*—E. A. Brill, Belfast Bank, Belfast. *Recording Secretary*—James J. Hyde, Essex House, Strandtown.

Uttoxeter Photographic Society.—(ESTABLISHED 1890.)—Meetings held at the Society's Rooms, Carter Street, Uttoxeter. *President*—Rev. C. F. Lowry Barnwell. *Vice-Presidents*—F. A. Bolton, C. W. Lyon, H. Meynell. *Committee*—S. B. Bamford, H. Ford, R. T. A Hardy, H. Holmes, — Udale, C. G. Wallis. *Secretary*—Alfred Parker, High Street, Uttoxeter.

Vale of Llangollen Camera Club.—(ESTABLISHED 1893.)—Meetings held at Salop House. *President*—Ralph Darlington, F.R.G.S. *Vice-Presidents*—J. M. Corney and Joseph Hall. *Committee*—Hiram Davies, Sergeant Bagshaw, John H. Davies, Jonathan Edwards. *Treasurer*—Gomer Rowlands. *Secretary*—Herbert Victor Davies, Salop House, Llangollen.

Wakefield Photographic Society.—(Established 1891.)—Meetings held at the Studio, Snow Hill View, Wakefield. *President*—Rev. A. Addison. *Vice-Presidents*—Major Norwood and J. Briggs, jun. *Committee*—Messrs. Miles, Holmes, Briggs, Shaw, and Dawson. *Hon Secretaries*—R. Robson and W. T. Wilkinson, c/o E. P. Shaw & Co., Limited, Market Place, Wakefield.

Walsall Amateur Photographic Society.—(Established 1892.)—Meetings held at the Y.M.C.A., Walsall. *President*—J. R. Cooper. *Vice-Presidents*—Frederick Brown, H. Eyland, Sydney Gedge, M.P., A. C. Greatrex, J.P., H. N. Grove, T. J. Hansor, John Hildick, Frank James, J.P., J. A. Leckie, C. A. Loxton, W. Oliver, G. G. Potter, F. C. Smith, Herbert Smith, Alfred Thacker, W. Thacker, George Warner, F. W. Willmore, J. S. Wilson, C. J. Windle. *Committee*—W. H. Bullock, J. W. Carver, W. C. Checkley, B. Greatrex, W. A. Hubball, W. Meikle, S. A. Newman, T. Partridge, H. B. Smith. *Secretary and Treasurer*—E. A. Day, 14 Westbourne Road, Walsall.

Walthamstow Photographic Society.—(Established 1894.)—Meetings are held at Mission Cottage, Vestry Road, Walthamstow. *President*—W. Houghton. *Committee*—J. E. Galliford, A. G. Gibbard, W. E. Lane, T. Willats, H. Saunders, H. A. Morison. *Treasurer*—W. A. Longmore. *Secretary*—Claud S. Scott, 'Brabourne,' The Drive, Walthamstow.

Walton Photographic Society.—(Established 1889.)—Meetings held at the Walton Church Schools, Liverpool. *President*—F. Murphy. *Council*—T. D. Blackburn, John Parke, H. T. Livesley, H. S. Simpson, George Latimer, W. W. Maver. *Secretary and Treasurer*—T. Bickerstaff, 79 Rawcliffe Road, Walton, Liverpool.

Walworth Junior Postal Camera Club.—(Established 1895.)—Circulates prints for criticism and exchange among the members once a month. Discussions on photographic matters are carried on in a note-book which accompanies the prints, in which also queries and answers are written and exchanges arranged. *Hon. Secretary and Treasurer*—Percy C. Cornford, 11 Grosvenor Street, Camberwell, London, S.E.

Warrington Amateur Photographic Society.—(Established 1887.)—Meetings are held in the Lecture Room, Warrington Museum. *President*—John Fairhurst. *Vice-Presidents*—C. B. Aylward and H. N. Houghton. *Council*—H. Bond, J. Critchley, R. Graham, J. Harding, T. Hesketh, G. Kirby, H. Milling, T. Welsby, J. Lyon Whittle. *Treasurer*—P. Dalton. *Secretary*—D. S. Stone, 1 Walker Street, Warrington.

Waterloo Social Camera Club.—(Established 1893.)—Meetings are held at Waterloo. *President*—J. T. Norman-Thomas. *Committee*—J. T. Norman-Thomas, C. W. Budden, J. C. Matthews, G. D. Dean, A. L. Griffith, E. Rawlins, A. N. Jack. *Treasurer*—J. C. Matthews. *Secretary*—C. W. Budden, 7 Cambridge Road, Waterloo, Liverpool.

West London Photographic Society (with which is incorporated the Chiswick Camera Club).—(ESTABLISHED 1888.)—Meetings are held at the Broadway Hall, Hammersmith. *President*—Leslie Selby. *Vice-Presidents*—W. A. Brown, G. F. Blackmore, A. Ebbs, J. J. Adam, C. Winter. *Council*—M. W. Cockerell, T. Coysh, C. Dixon, George Lamley, H. René Rainger, G. E. Varden, A. E. Walker, J. Wilson, R. Horton, C. J. White, A. E. Cockerell, J. J. Twinan. *Treasurer*—H. Selby. *Secretary*—James Stein, 28 Martin's Lane, Cannon Street, E.C.

West Surrey Photographic Society.—(ESTABLISHED 1887.)—Meetings held at the Felix Institute, Lavender Hill, S.W. *President*—George H. James. *Vice-Presidents*—F. H. Smith, J. Bull, G. H. Seward, J. T. Price. *Committee*—J. Agars, J. Bulbeck, W. J. Channon, A. W. Curtiss, H. Hoad, E. Pointon, Mrs. White. *Librarian*—J. T. Price. *Hon. Secretary and Treasurer*—C. E. White, 17 Garfield Road, Lavender Hill, S.W. *Assistant Secretarg*—G. Bottle, 55 Lavender Sweep, S.W.

Weymouth and District Camera Club.—(ESTABLISHED 1895.)—Meetings held at Milledge's Rooms, 74 St. Thomas's Street, Weymouth. *President*—Colonel R. H. Palmer, R.A , M.R.A.C. *Hon. Secretary*—E. C. Bennett, 10 Newberry Terrace, Weymouth.

Widnes Photographic Society.—(ESTABLISHED 1893.)—Meetings are held at the Drill Hall, Widnes. *President*—V. C. Driffield. *Vice-Presidents*—G. J. Warner and J. Newburn. *Council*—J. S. Sinclair, A. E. Waring, J. Priestnall, F. Brown, J. Pilling. *Treasurer*—T. Cosier. *Secretary*—A. J. Squires, F.C.S., 84 Derby Road, Farnworth, Widnes.

Wigan Photographic Society.—(ESTABLISHED 1890.)—Meetings held at the Quadrant Café, Rodney Street, Wigan. *President*—R. Wardman. *Vice-Presidents*—Rev. J. S. Barnes, G. R. Newman, S. Richardson. *Council*—J. H. Atherton, B. B. Hartley, John Smith, H. S. Hill, P. Clark, W. E. Boyce, G. M. Martin. *Secretary and Treasurer*—Frederick Betley, 10 Springfield Street, Wigan.

Windsor Amateur Photographic Research Camera Club.—(ESTABLISHED 1893.)—Meetings held at Montpelier House, or on invitation of some of the members. *President*—James Collins. *Vice-Presidents*—Sir David Taylor, J.P., and James Henderson, M.A., J.P. *Committee*—Sidney Greer, Joseph McConnell, John Thompson. *Treasurer*—Robert B. Gardner. *Secretary*—William James Gibson, Montpelier House, Belfast.

Wolverhampton Photographic Society.—(ESTABLISHED 1888.)—Meetings held at the Blind Institute, Victoria Street, Wolverhampton. *President*—H. E. Perry. *Vice-President*—R. Muras. *Committee*—J. Gale, H. Holcroft, T. H. Cox, J. M. Taylor, R. W. Deans, W. G. Orme, S. R. Rhodes, F. White. *Lanternist*—J. Gale. *Treasurer*—F. J. Gibson. *Secretary*—George Hanmer, 2 Dudley Road, Wolverhampton.

Woodford Photographic Society.—(ESTABLISHED 1893.)—Meetings are held at the Coffee Tavern, George Lane, South Woodford. *President*—E. Marriage. *Council*—Messrs. Caird, Goodwin, and Malby. *Lanternist*—E. Noble. *Secretary and Treasurer*—F. E. Emler, 1 Florence Villas Chelmsford Road, Woodford.

Woolwich Photographic Society.—(ESTABLISHED 1892.)—Meetings held at the St. John's Schools, Wellington Street, Woolwich. *President*—Colonel C. D. Davies. *Vice-Presidents*—Rev. S. E. Chettoe, M.A., W. H. Dawson, H. H. Barker, J. Borthwick Panting. *Council*—Messrs. Churchill, J. Cregan, J. Desforges, W. R. Dunger, J. Hope, R. J. Redding. *Librarian*—H. J. Maskell. *Hon. Secretary and Treasurer*—Frederick W. Machen, 161 Griffin Road, Plumstead, S.E. *Hon. Assistant Secretary*—W. G. Champion.

Woolwich Polytechnic Photographic Society.—(ESTABLISHED 1892.)—Meetings held at the Polytechnic, William Street, Woolwich. *President*—A. R. Dresser. *Vice-Presidents*—Right Hon. Viscount Maitland, Andrew Pringle, G. H. Banister. *Committee*—Messrs. Kemp, Taylor, Ellis, and Forsdyke. *Secretary and Treasurer*—W. Dawes, 145 Chesnut Road, Plumstead.

Worcester Tricycle Club (Camera Section).—(ESTABLISHED 1892.)—Meetings held at the Bell Hotel, Worcester. *President*—J. Wilkes. *Committee*—J. J. Cam, W. Cam, J. Boughton, S. Hill, J. Judson, T. James, J. S. Sautouna, F. Hill. *Treasurer*—F. Hill. *Secretary*—T. J. Hobson, 15 Albany Terrace, Britannia Square, Worcester.

Wycombe Camera Club.—(ESTABLISHED 1892.)—Meetings held at the South Bucks Auction Mart, Wycombe. *President*—R. D. Wheeler. *Committee*—H. H. Thornbery, F. L. Pearce, — Sherriff, I. A. Howell, B. Baker, — Broughton, F. Turner. *Secretary and Treasurer*—J. Wilford, 7 High Street, High Wycombe.

Y.M.C.A. Camera Club.—Meetings held at Christian Union Buildings, Lower Abbey Street, Dublin. *President*—E. MacDowel Cosgrave, M.D. *Vice-Presidents*—L. Davidson, G. W. Rikey, A. E. Campbell. *Committee*—Messrs. Parnell, Stewart, Thompson, Campbell, Barnes, Summers, Barber, and Shiels. *Secretary*—E. C. Matson, 34 Capel Street.

York Photographic Society.—(ESTABLISHED 1887.)—Meetings are held at the Victoria Hall, York. *President*—Watson Hirst. *Vice-President*—Thomas Brown. *Council*—Messrs. Weatherill, Hardcastle, Saville, Vincent, Hargrave, and Hunter. *Treasurer*—R. Bainbridge. *Secretary*—Frederic G. P. Benson, 50 Scott Street, York.

Yorkshire Philosophical Society (Photographic Section).—(ESTABLISHED 1888.)—Meetings are held at the Museum, York. *President*—Tempest Anderson, M.D., J.P., B.Sc. *Vice-Presidents*—William Monkhouse and John Kitching. *Committee*—A. Tempest, Malcolm Spence, George Baker, B. Wales. *Secretary and Treasurer*—H. Dennis Taylor, F.R.A.S., Trenfield, Holgate, York.

COLONIAL PHOTOGRAPHIC SOCIETIES.

Amateur Photographic Association of Victoria, Melbourne.—(ESTABLISHED 1883.)—Meetings held at the Royal Society's Hall, Victoria Street, Melbourne. *Secretary*—J. H. Harvey, Public Works Department, Melbourne.

Auckland Photographic Club.—General Meetings, the second and fourth Thursday in each month. Annual Meeting in October. Club Rooms, Australian Mutual Provident Society's Buildings, Queen Street, Auckland. *Hon. Secretary*—G. R. Boulton.

Ballarat Amateur Photographic Association, Victoria, Australia.—(ESTABLISHED 1886.)—Meetings are held at the School of Mines, Ballarat. *President*—W. H. Wooster. *Vice-President*—J. Fletcher. *Committee*—The Officers, with Miss Baker and Miss Oddie. *Treasurer*—J. J. Young. *Secretary*—Fred Foster, 146 Lydiard Street, Ballarat, Victoria, Australia.

Barossa Camera Club, Nuriootpa, South Australia.—*Hon. Secretary*—Walter J. Ponder.

Canterbury Philosophical Institute (Photographic Section), Christchurch.—Meetings held on second Monday in each month. *Secretaries*—S Page and Walter Burke.

Cape Town Photographic Club.—(ESTABLISHED 1890.)—Meetings are held at the Y.M.C.A. Hall, Cape Town. *President*—David Gill, LL.D., F.R.S., &c. *Vice-President*—Professor W. S. Loyeman. *Council*—D. C. Andrew, T. W. Cairncross, J. P. Edwards, A. Gracie, R. T. Pett, E. J. Steer, J. R. Wignall, C. Ray Woods. *Secretary and Treasurer*—Andrew James Fuller, 37 Grave Street.

Dunedin Photographic Society.—Meetings, third Wednesday in each month, in Union Chambers. *Secretary*—R. A. Ewing, c/o New Zealand Drug Company.

Foochow Camera Club.—(ESTABLISHED 1892.)—Meetings held at the Club Rooms. *President*—G. Siemssen. *Vice-President*—F. J. Rentzsch. *Hon. Treasurer*—H. W. Churchill. *Hon. Secretary*—J. Mencarini, Foochow, China.

Gordon College Amateur Photographic Association.—Meetings held at Gordon College, Geelong, Australia, on the second and fourth Fridays in each month. *President*—H. G. Roebuck. *Vice-Presidents*—R. C. Hocking and J. B. Leitch. *Treasurer*—A. Purnell. *Secretary*—J. Hammerton, jun., 73 Little Ryrie Street, Geelong, Australia.

Hamilton Association Camera Club.—(ESTABLISHED 1892.)—Headquarters, Museum, Main Street, West. Annual meeting, April. Meetings, last Tuesday of each month. *Secretary and Treasurer*—Wm. White, 9 James Street, North, Hamilton, Ontario, Canada.

Ipswich and West Moreton Amateur Photographic Society, Queensland, Australia.—(ESTABLISHED 1893.)—Meetings on the second Wednesday of each month. Annual Meeting in the month of July of each year. *Hon. Secretary*—Mr. E. Bostock, Brisbane Street, Ipswich, Queensland, Australia.

Kimberley Camera Club.—(ESTABLISHED 1890.)—Meetings held at the Club Rooms. *President*—James Lawrence, M.L.A. *Chairman*—Montague Thane. *Vice-Chairman*—F. H. Hancox. *Council*—J. Childs, E. Goffe, L. Atkinson. *Secretary and Treasurer*—Charles Howie, P.O. Box 233, Kimberley, S.A.

Madras Amateur Photographic Society.—(ESTABLISHED 1888.)—Meetings held at the Masonic Hall, Mount Road, Madras. *President*—F. Dunsterville. *Vice-Presidents*—C. Michie Smith, B.Sc., F.R.S.E., and Surgeon-Major J. L. Van Geyzel, M.B., F.I.C. *Committee*—E. Thurston, A. L. H. Palmer, Mrs. G. L. Chambers, C. E. Phipps, A. E. Lawson, E. W. Stoney, *Treasurer*—V. G. Lynn. *Secretary*—J. L. Walker, M.A., c/o Messrs. Walker & Co., Madras.

Melbourne Working Men's College Photographic Society.—Meetings are held at Latrobe Street, on the first Tuesday in each month. *Secretary*—Leopold Goodwin.

Montreal Camera Club.—(ESTABLISHED 1890. INCORPORATED 1892.)—Place of Meeting, 4 Phillips Square, Montreal. Annual Meeting, first Tuesday in May. Regular Meetings, first and third Tuesdays from October to May inclusive. *President*—Edward Stanger. *Vice-President*—A. J. Ferguson. *Committee*—George Sumner, Howard T. Barnes, Frank R. Redpath, Charles Lester, George McDougall, Nevill Norton Evans. *Treasurer*—A. Clarence Lyman. *Secretary*—Alfred W. Cole, 28 Victoria Street, Montreal, Canada.

Nelson (New Zealand) Camera Club.—Meetings are held on the third Friday in each month. *President*—C. T. Fell. *Committee*—Messrs. Glasgow, Pitt, Brusewitz, and Jackson. *Custodian*—F. Moore. *Secretary and Treasurer*—Arthur H. Patterson, care of Messrs. Sclanders & Co., Nelson, New Zealand.

Northern Tasmania Camera Club.—(ESTABLISHED 1889.)—Meetings held on the third Wednesday in each month at Mr. R. L. Parker's rooms, St. John Street. *Secretary*—F. Styant Browne.

N.S.W. Lands Department Photographic Society.—Meets last Thursday in each month. *Secretary*—O. W. Ballhausen.

Oudtshoorn Camera Club.—(ESTABLISHED 1895.)—*President*—F. Pfuhl. *Vice-President*—H. Ross. *Council*—F. Pfuhl, H. Ross, S. Wernikoff B. Bergh, R. Blore. *Treasurer*—B. Bergh. *Secretary*—R. C. Blore.

Photographic Association of Canada.—(ESTABLISHED 1884.)—Place of meeting, Toronto. *President*—H. F. Johnson. *Vice-Presidents*—A. G. Pattaway (Ottawa) and J. F. Jackson (Barrie). *Executive Committee*—The Officers. *Treasurer*—J. G. Ramsay (Toronto). *Secretary*—E. Poole, St. Catharine's, Ontario.

Photographic Society of India.—(ESTABLISHED 1886.)—Meetings are held at 57 Park Street, Calcutta. *Patron*—H.E. Lord Elgin, the Marchioness of Lansdowne, Lady Mackenzie. *President*—Colonel Waterhouse, S.C. *Vice-Presidents*—Colonel Rogers, R.E., and N. Giannacopulo. *Committee*—P. Donaldson, H. B. Havell, E. Moreau, T. A. Pope, E. M. Showers, the Maharajkunsar P. K. Tagore, A. Tocher, T. H. Wilson. *Hon. Treasurer*—T. N. Maniachi. *Hon. Secretary*—Arthur Casperoz, 57 Park Street, Calcutta.

Photographic Society of Japan.—(ESTABLISHED 1889.)—*President*—Viscount Enomoto, Minister of Education for Japan. *Vice-Presidents*—Professor D. Kikuchi, M.A. (Cantab.), Dr. W. S. Bigelow, Kajima Seibei, Dr. E. Baelz. *Treasurer*—Y. Ishizu. *Secretaries*—Professor H. Ishikawa and Professor W. K. Burton.

Queensland Amateur Photographic Society.—(ESTABLISHED 1887.)—General Meetings are held on the fifteenth of each month at the Contractors' Exchange, Courier Buildings, Queen Street, Brisbane. *Hon. Secretary*—D. Mactaggart.

Singapore Amateur Photographic Society.—Meetings are held at 53 Hill Street, Singapore. *President*—E. J. Nanson. *Committee*—A. W. Bean and G. Brinkworth. *Treasurer*—F. M. Elliot. *Secretary*—E. F. Gros, Singapore.

South Australian Photographic Society.—(ESTABLISHED 1885.)—Meetings held at the Chamber of Manufactures, North Terrace, Adelaide. *Patrons*—Sir Thomas Fowell Buxton, Bart., K.C.M.G., Hon. Sir E. T. Smith, K.C.M.G., M.L.C., Hon. Dr. Cockburn, M.P., Professor E. H. Rennie, M.A., D.Sc., Professor W. H. Bragg, M.A., J. J. Green. *President*—A. W. Dobbie. *Vice-Presidents*—A. Scott, B.A., and A. H. Kingsborough. *Committee*—The Executive Officers, C. F. Clough, A. W. Marshall, S. P. Bond. *Auditors*—C. Radcliffe and — Kerr. *Hon. Librarian and Assistant Secretary*—J. D. Dixon. *Hon. Treasurer*—R. B. Adamson. *Hon. Secretary*—J. Gazard.

Southland Camera Club, New Zealand.—Meetings, second Thursday in each month. *Secretary*—H. A. Macdonald.

St. John Camera Club.—(ESTABLISHED 1893.)—Meetings held at 65 William Street, St. John, New Brunswick. *Secretary*—J. Kaye-Allison, P.O. Box 401, St. John, N.B. Canada.

Sydney Amateur Photographic Society.—Meetings on the second Thursday in each month. *President*—E. L. Montefiore. *Vice-Presidents*—H. Paterson and J. H. Simpson. *Hon. Secretary*—Henry Chapman, 143 King Street, Sydney.

Toronto Camera Club.—(ESTABLISHED 1885, INCORPORATED 1893.)—Place of Meeting, the Forum Building, corner of Yonge and Gerrard Streets, Toronto, Canada. *President*—E. E. King, M.D. *Vice-Presidents*—A. W. Croil and W. B. Varley. *Committee*—Hugh Neilson, W. H. Moss, J. G. Ramsey, G. R. Baker, F. D. Manchee, John J. Woolnough. *Secretary and Treasurer*—Ernest M. Lake, 14 King Street West, Toronto, Canada.

Upper Canada College Camera Club.—(ESTABLISHED 1891.)—Meetings are held at Upper Canada College, Toronto, Ontario, Canada. *Secretary*—O. M. Biggar, 249 Simcoe Street, Toronto, Ontario, Canada.

Victoria Camera Club.—(ESTABLISHED 1887.)—Meetings held at the Victoria Coffee Palace. *President*—Hon. F. S. Dobson, LL.D. *Vice-President*—A. M. Henderson. *Committee*—J. Pettigrew, A. Harper, H. B. Clutten. *Secretary and Treasurer*—Alfred Henry Farmer, 54 Elizabeth Street Melbourne.

Wanganui Camera Club, New Zealand.—*President*—A. Elliott. *Hon. Secretary*—D. Meldrum.

Wellington Camera Club.—(ESTABLISHED 1892.)—Meetings are held on the second Friday in each month in Exchange Buildings, Lambton Quay. *Hon. Secretary*—W. Snodgrass, Exchange Buildings, Lambton Quay, Wellington, New Zealand.

West Australian Photographic Society.—(ESTABLISHED 1894.)—Meetings held at Perth. *Patron.*—Sir Wm. C. F. Robinson, G.C.M.G. *President.*—Sir John Forrest, K.C.M.G. *Vice-Presidents.*—Sir George Shenton, Kt., M.L.C., Hon. S. H. Parker, M.L.C., Lt.-Col. Phillips. *Council.*—H. R. England, W. J. Hancock, H. Kelsall, M.D., H. J. Pether, W. Bacon. *Treasurer.*—W. M. Atkins. *Secretary.*—A. R. L. Wright, Public Works Department, Perth.

CONTINENTAL PHOTOGRAPHIC SOCIETIES.

AMATEUR FOTOGRAFEN-VEREENIGING TE AMSTERDAM. Established September 1, 1887. Headquarters and Studio, Handboogstraat 2. Meetings, Wednesday, fortnightly. Ign. Bispinck, President. W. H. D. Witt, Librarian. Geo. Peck, Commissary. A. W. de Flines, Treasurer. D. Wilmerink, Handboogstraat 2, Secretary.

ASSOCIATION BELGE DE PHOTOGRAPHIE.—Established 1874. Meetings are held at the Palais du Midi, Bruxelles. Jos. Casier, President. Jos. Maes and Massange de Louvrex, Vice-Presidents. A. Canfyn, Alb. Lunden, A. Nyst, — de Vaux, E. Orban-Viot, H. Peltzer, Ch. Puttemans, A. Rutot, J. Savoné, V. Selb, — Stappers, and H. Vassal, Committee. M. Boschmans, Treasurer. M. Vanderkindere, 97 Avenue Brugmann, à Uccle-Bruxelles, Secretary. Alb. Robert, Palais du Midi, à Bruxelles, Assistant Secretary.

ASSOCIATION NATIONALE DES PHOTOGRAPHES AMATEURS.—Fondée le 15 Mars, 1894, et autorisée par arrêté préfectoral du 22 Décembre, 1894. Place of Meeting, au domicile du Président, actuellement à Châteaugiron (Ille-et-Vilaine). Alfred Savary, President. M. Jousseaume, Vice-President. MM. Cosnard, Le Sage de la Haye, Marnelle, and Le Millier, Committee. Roul de la Hellière, au Château de Châteaugiron (Ille-et-Vilaine), Secretary and Treasurer.

DANSK FOTOGRAFISK FORENING.—Established April 5, 1879. Place of Meeting, Copenhagen. Chr. Christensen, President. Peter L. Petersen, Vice-President. P. Fristrup, Juncker Jensen, F. Söndenbro, Johan Crone, Council. Johan Hauersler, Treasurer.

DEUTSCHE GESELLSCHAFT VON FREUNDEN DER PHOTOGRAPHIE IN BERLIN.—Meldungen zum Beitritt für die Deutsche Gesellschaft von Freunden der Photographie nehmen die Mitglieder des Vorstandes entgegen und versenden dieselben auf Wunsch die 'Satzungen' der Gesellschaft. Näheres durch den Schriftführen Herrn Direktor Schultz-Hencke, Lette-Institut, Berlin S.W., Königgrätzer-strasse 90. Der Jahresbeitrag beträgt M.20,00. für Auswärtige jährlich M.14.

DEUTSCHER PHOTOGRAPHEN VEREIN.—Established 29 December, 1876. Place of Meeting, Jedes Jahr une Wanderversamlung. K. Schwier, President. C. Kindermann, Vice-President. F. Langbein, George Alpers, jun., C. Kesselhuth, and Karl Wunder, Committee. K. Schwier, Weimar, Secretary and Treasurer.

FACHVEREIN DER PHOTOGRAPHEN ZU BERLIN.—Established 1876. Reorganised 1894. Place of Meeting, Engl. Hof, Neue Rossstr., 3. Israr Brettschneider, President. Paul Tarksteit, Vice-President. Eduard Günther, Treasurer. Rudolf Obizh and Eduard Günther, Linienstrasse, 150, Secretaries.

GRÖNINGER AMATEUR PHOTOGRAPHEN VEREENIGING 'DAGUERRE.'—Established 1891. Meetings held at the Hotel Willems. R. Roelfsema, President. H. W. Freseman Vietar, Vice-President. C. A. M. van Riet, Treasurer. Thr. O. T. Quintus, Oosterstraat Groningen, Secretary.

HAARLEMSCHE AMATEUR FOTOGRAFEN CLUB.—Established 1891. Place of Meeting, Haarlem Societeit Vereeniging. F. J. M. Huijsser, President. C. G. H. Bakker, Treasurer. Maurits H. Binger, Zylweg, 55, Haarlem, Secretary.

LE PHOTO VELO CLUB DE PARIS.—M. Violette, 21 Boulevard St. Germain, Paris, France, Secretary.

MÜNCHENER PHOTOGRAPHISCHE GESELLSCHAFT.—Established 1879. Place of Meeting, Müuchen. Adalbert Werner, President. Otto Wernhard, Treasurer. E. Kieser, Secretary. Address of Society, Deutsches Haus, Carlsplatz, München.

NEDERLANDSCHE VEREENIGING VAN DILETTANT PHOTOGRAPHEN 'HELIOS.'—Established, 1872. Meetings held at the Photographic Studio and Club Rooms of the Society, Spui, Amsterdam. P. Fraisfinet, President. D. van Haren Noman, M.D., Vice-President. J. van Geuns, M.D., and J. van Rees, M.D., Committee. C. H. A. Westhoff, M.D., Treasurer. J. C. A. Wertheim Salomonson, M.D., 139 Stadhouderskade, Amsterdam, Secretary.

CONTINENTAL PHOTOGRAPHIC SOCIETIES—*Continued.*

PHOTO-CLUB DE PARIS.—Established 1888. Place of Meeting, 40 Rue des Mathurins, Paris. Maurice Bucquet, President. E. Mathieu, Vice-President. M. Brémard, H. Binder, A. Darnis, P. Gers, R. Demachy, P. Naudot, A. Toutain, and D. Touslain, Committee. H. Guérin, Treasurer. Paul Bourgeois, 40 Rue des Mathurins, Paris, Secretary.

PHOTOGRAPHISCHE GESELLSCHAFT, HAMBURG, ALTONA.—Established November 4th, 1873. G. Wolf, Hamburg, President. Th. Petersen, St. Pauli, Vice-President. Herm. Boock, C. W. Lüders, Kunstschleifer, Committee. W. Köhnen, Altona, Treasurer. H. Boock, Bergstrasse, 26. Meets first Tuesday in the month, at 8 p.m., at Gerhafstrasse, 10, Hamburg.

PHOTOGRAPHISCHE GESELLSCHAFT IN WIEN.—Established 1861. Place of Meeting, Palais der Akademie der Wissenschaft, Wien. Ottomar Volkmer, President. Dr. Carl Böhm von Böhmersheim, Vice-President. Carl Angerer, Wilhelm Burger, Josef Maria Eder, Michael Frankenstein, J. Löwy, Wilhelm Müller, Wilhelm Freiher von Schwarz-Senborn, Robert Sieger, Josef Ungar, and Louis Zwickl, Committee. Ludwig Schrank, Treasurer. Dr. Josef Székely, Secretary, Wien I. Elisabethstrasse, 2.

PHOTOGRAPHISCHE VEREIN ZU BERLIN.—Established 1863. Place of Meeting, Berlin. P. Grundner, President. T. C. Schaarwaechter, Vice-President. Herren Stoll, Cornand, Gerike, Himly, and Schultz-Hencke, Committee. E. Martini, Treasurer. Dr. A. Miethe (Hon. Fellow of the Royal Photographic Society), Braunschweig, Lachmannst., 7, Secretary.

SOCIÉTÉ FRANÇAISE DE PHOTOGRAPHIE.—Established 1854. Place of Meeting, 76 Rue des Petits-Champs, Paris. M. le docteur Marey, President. M. Davanne, Vice-President. MM. Davanne (Président), Bardy and Le Général Sebert (Vice-Présidents), Perrot de Chaumeux (Secrétaire Général), Pector and Londe (Secrétaires Généraux adjoints), Audra (Trésorier), and Bordet (Bibliothécaire), Council. M. Audra, Treasurer. M. Perrot de Chaumeux, à Enghien-les-Bains, Secretary.

SOCIÉTÉ GENEVOISE DE PHOTOGRAPHIE.—Established 1882. Meetings held at the Society's Rooms, 1 Grand Mézel. Dr. E. Batault, President. MM. Lacombe and Mazel, Vice-Presidents. J. A. Bouvier, Librarian. L. Jaquerod, Treasurer. MM. John Bosson, Rue Thalberg, 4, and Blachier, Tranchées de Rive, 11, Secretaries.

SOCIÉTÉ NANTAISE DE PHOTOGRAPHIE.—Established 1881. M. du Hanlay, Lieut.-Colonel, President. M. Toublanc, Vice-President. Ch. Planté, H. Bureau, P. du Minehy, Committee. M. Tassain, Treasurer. Paul Crémant, Rue d'Alger, 13, Nantes, Secretary, and Pierre Courant, Assistant Secretary. Réunion le premier vendredi de chaque mois, au Cercle des Beaux-Arts.

SOCIÉTÉ PHOTOGRAPHIQUE PROFESSIONNELLE.—Established 1878. Place of Meeting, Place St. Gervais, 6, à Genève. E. Dovaz, President. Charles Racine, Vice-President. Louis Barral, Treasurer. Antoine Chevalley, Siège de la Société, Secretary.

SOCIÉTÉ VERSAILLAISE DE PHOTOGRAPHIE.—Established 1884. Séances de la Société les premiers Mardis de chaque mois à la Mairie à 8 heures et demie du soir. Maurice Bucquet, President. L. Ottenheim, Vice-President. Comité d'administration, Committee. M. Gavin, Treasurer. Jessé Curely, 20 Rue de Provence, Versailles, Secretary.

VEREIN ZUR FOERDERUNG DER PHOTOGRAPHIE.—Established 1869. Place of Meeting, Berlin. Professor Dr. H. W. Vogel, President. Professor O. Raschdorff, Vice-President. Dr. E. Vogel, H. Haberlandt, Hans Schmidt, M. Kricheldorff, F. Staudigl, A. Herzheim, W. Dieskau, P. Loescher, F. S. Archenhold, and E. Fuchs, Committee. Gustav Schmidt, Treasurer. Paul Hanneke, Berlin, W., Buelowstrasse, 99, Secretary.

VEREIN ZUR PFLEGE DER PHOTOGRAPHIE UND VERWANDTER KÜNSTE, FRANKFURT A. MAIN.—Established 1875. Docent am der technischen Hochschule, F. Schmidt, President. H. Maas, Vice-President. T. H. Voigt, C. Ruf, W. Pöllot, Dr. C. Kleinschmidt, and J. E. Rumpel, Committee. C. Böttscher, Treasurer. Dr. A. Shebel, Protocoll Secretary. Th. Haake, Frankfurt a. Main, Correspondenz Secretary.

AMERICAN PHOTOGRAPHIC SOCIETIES.

Agassiz Association, Manhattan Chapter, New York.—Photographic Section Established 1888. Meetings held at 141 East Fortieth Street, New York City. C. F. Groth, President. C. Kromm, Vice-President. C. F. Groth, E. B. Miller, W. S. Miller, H. T. Rowley, E. Staubsandt, F. Fruhan, J. Brennich, Miss M. Miller, and Miss M. Hargrove, Committee. W. S. Miller, Treasurer. Ed. B. Miller, 141 East Fortieth Street, New York City, Secretary.

Akron Camera Club.—Meetings are held at residences of members on the second Tuesday of each month. Professor C. M. Knight, President. Edward Terrass, Vice-President. Frank Adams, Treasurer. Professor W. D. Shipman, 231 South Union Street, Akron, Ohio, U.S.A., Secretary.

Albany Camera Club.—Organized October 21, 1887. Meetings held at the Club House, 72 Chapel Street, Albany, N.Y. W. W. Byington, President. Wait H. Stillman, Vice-President. J. S. Paterson, Charles S. Pease, J. S. Van Buren, Prof. Maurice Perkins, G. H. Russell, T. C. Leutze, Dr. S. B. Ward, and Charles W. Reynolds, Directors. Edward D. Mix, Treasurer. Charles B. Tillinghast, 72 Chapel Street, Albany, N.Y., Secretary.

Amateur Photographic Association (Selma, Alabama).—Established Dec. 29, 1887. Meetings held at 916 Broad Street. William S. Monk, President. S. A. Sexton, Committee. S. Orlando Trippe, Selma, Dallas Co., Alabama, Secretary and Treasurer.

American Lantern Slide Interchange.—Established 1885. Incorporated 1893. Meetings held at 361 Broadway, New York, on November 15 of each year. F. C. Beach, W. H. Rau, William H. Olmsted, W. H. Cheney, and John S. Paterson, Board of Managers. F. C. Beach, 361 Broadway, New York, General Manager and Secretary. William H. Olmstead, Syracuse, N.Y., and W. H. Rau, Philadelphia, Pa., Assistant Managers.

Bethlehem Photographic Society.—Established January, 1894. Meetings held at Bethlehem, Pa., U.S.A. Dr. E. M. Hyde, President. H. S. Housekeeper, Vice-President. C. S. Smith, Treasurer. F. E. Hausmann, Bethlehem, Pa., U.S.A., Secretary.

Boston Camera Club.—Established 1881. Meetings held at the Club Rooms, 50 Bromfield Street, Boston, Mass. George M. Morgan, President. J. P. Lond, Charles Sprague, and W. O. Witherell, Vice-Presidents. The Officers, and F. H. Manning, E. O. Cockayne, C. H. Currier, E. R. Andrews, R. A. Bullock, and H. Packard, Committee. C. H. Chandler, Treasurer. C. H. Perry, 50 Bromfield Street, Boston, Mass., U.S.A., Secretary.

Bridgeton Camera Society.—Established January, 1890. Incorporated March, 1893. Meetings held at 48–50 East Commerce Street, Bridgeton, N.J. Henry A. Janvier, President. George Hampton, Vice-President. Hugh L. Reeves, Howard W. Fithion, and Sydney E. Bower, Managing Committee. Sydney E. Bower, Treasurer. Henry W. Scull, Cumberland National Bank, Bridgeton, N.J., Secretary.

Brooklyn Academy of Science (Photographic Section).—Organized March 26, 1888. J. W. Holbrook, jun., 462 Hart Street, Brooklyn, N. Y., Secretary.

AMERICAN PHOTOGRAPHIC SOCIETIES—*Continued.*

Brooklyn Institute of Arts and Sciences (*Department of Photography*).—Established 1887. Meetings held at 201 Montague Street. J. Frederick Hopkins, President. Myers R. Jones and George W. Wundram, Vice-Presidents. J. Frederick Hopkins, George W. Wundram, Professor William C. Peckham, William J. Bryant, Myers R. Jones, Henry L. Underhill, Mrs. C. H. Burdett, James W. Kent, L. D. Martens, Frank A. Perret, and James H. Ferguson, Executive Committee. L. D. Martens, Treasurer. Henry L. Underhill, 144 South Elliott Place, Brooklyn, New York, Secretary.

Brooklyn (*N.Y.*) *Academy of Photography.*—Incorporated in February, 1887. Meetings held at 177 Montague Street, Brooklyn, New York, U.S.A. Augustus A. Goubert, President. Samuel Baron, First Vice-President. William B. Dudley, Second Vice-President. Frank La Manna, John Merritt, M.D., H. M. Lewis, M.D., Starks W. Lewis, and C. S. Reynolds, Committee. A. R. Pardington, Curator and Librarian. William T. Wintringham, Treasurer. William Arnold, Recording Secretary. H. B. Fullerton, 7 Bowling Green, New York City, Corresponding Secretary.

Buffalo (*N.Y.*) *Camera Club.*—Established October 10, 1888. Meetings are held at Market Arcade, Main Street, Buffalo, N.Y. George J. Bailey, President. O. H. Hauenstein, Vice-President. William J. Haskell, 445 Richmond Avenue, Buffalo, N.Y., U.S.A., Secretary and Treasurer.

California Camera Club.—Incorporated April 5, 1890. Meetings held at 819 Market Street, San Francisco, California. W. B. Webster, President. I. E. Thayer, First Vice-President. E. W. Jensen, Second Vice-President. W. E. Goodrum, H. C. Cantwell, George H. Knight, W. S. McClure, Directors. E. G. Eisen, Treasurer. H. B. Kosmer, 819 Market Street, Room 58, San Francisco, California, Secretary.

Camera Club of Mount Vernon.—Established 1895. Meetings are held at Studio of W. F. Slaight, Fourth Avenue, Mount Vernon, New York, U.S.A. Miss Mary E. Jennings, Secretary.

Camera Club of the Capital Bicycle Club.—Established 1891. Meetings held at 409 Fifteenth Street, Washington, D.C., U.S.A. Charles Richards Dodge, President. E. Lee Ferguson, 1338 West Street, N.W., Washington, D.C., Secretary and Treasurer.

Camera Club of the University of Nebraska.—Established 1892. Meetings held at the Chemical Laboratory of the University of Nebraska, corner of Twelfth and R Streets, Lincoln, Neb., U.S.A. Miss Rosa Bouton, 1436 South Street, Lincoln, Neb., U.S.A., Secretary and Treasurer.

Camera Club of the University of Pennsylvania.—Established 1889. Meetings held at the College Hall, University of Pennsylvania, Thirty-sixth Street and Woodland Avenue, Philadelphia, Pa. Chas. R. Hinchman, 3655 Chestnut Street, Philadelphia, Pa., U.S.A., Secretary.

Camerads of New Brunswick, N.J.—Established 1882. Meetings held in Rutger's College. Peter T. Austin, Ph.D., President. William D. Horn, Vice-President. George Parsell, J. Arthur Blish, and Frederick Ulrich, Council. Charles V. Myers, Treasurer. Harvey Iredell, D.D.S., Lock Box 34, New Brunswick, N.J., Secretary.

Central Camera Club, Brooklyn, Y.M.C.A.—Established 1888. Meetings held at the Studio, 502 Fulton Street, Brooklyn, N.Y. B. A. Burger, 160 Atlantic Street, Brooklyn, N.Y., U.S.A., Secretary.

AMERICAN PHOTOGRAPHIC SOCIETIES—*Continued.*

Chautauqua Photographic Exchange Club.—Miss C. L. Pierce, Elmhurst, Riverside, Conn., U.S.A., Secretary and Treasurer.

Chicago Camera Club.—Established 1888. Meetings are held at 184 Wabash Avenue on the second Tuesday of each month at Eight o'clock. Annual Meeting in April. Rooms always open and in charge of competent attendant. Members of other societies from all parts of the world always welcome, and dark rooms and studio (completely equipped) at their disposal. M. L. Williston, D.Sc., President. M. R. Brown, M.D., and Mrs. N. Gray Bartlett, Vice-Presidents. T. B. Patterson, Treasurer. W. W. Abbott, Secretary.

Chicago Society of Amateur Photographers.—Established 1886. Meetings held at Noonday Rest, 4 East Monroe Street. Walter A. Morse, President. Marshall Waite, Treasurer. F. F. Gayford, 597 Cleveland Avenue, Chicago, Ill., U.S.A., Secretary.

Cleveland (Ohio) Camera Club.—Established January 25, 1887. Meetings held at 5 Euclid Avenue on the first and third Tuesday evenings of each month at Eight p.m. The Annual Meeting is held on the first Tuesday evening in January, unless that Tuesday is the 1st of January, in which case it is deferred until the third Tuesday. Frank Dorn, President. Alfred Ogler, Vice-President. William Dorn, Treasurer. R. Dayton, M.D., 1202 Willson Avenue, Cleveland, Ohio, U.S.A., Secretary.

Colorado Camera Club Association.—Established September, 1890. Meetings held at the Club Rooms, 329 Sixteenth Street, Denver, Col. W. H. Jackson, President. H. H. Buckwalter, Vice-President. W. H. Jackson, H. D. Smith, H. H. Buckwalter, A. D. Gilleland, S. C. McCurdy, J. P. Brockway, C. D. Kirkland, Board of Directors. H. D. Smith, Treasurer. H. D. Gilleland, 1832 Clarkson Street, Denver, Col., Secretary.

Columbia Camera Club of Astoria.—Established 1893. W. Timson, 598 Commercial Street, Astoria, Ore., U.S.A., Secretary.

Columbia College (N. Y.) Amateur Photographic Society.—Established 1886. Meetings at Columbia College twice a month. Henry R. Taylor, President. Dwight Taylor, Treasurer. H. M. Brookfield, Secretary.

Columbian College (Washington, D. C.) Camera Club.—Established 1888. Ordinary Meetings at Columbian College, Washington, D. C., every Wednesday afternoon. Allan J. Houghton, President. Edwin W. Ashford, Vice-President. W. B. Asmussen, Librarian. A. J. Houghton, Treasurer. Charles P. Spooner Secretary.

Columbia Photographic Society.—Organized December 7, 1889. Incorporated 1894. Meetings are held at 1507 Columbia Ave., Philadelphia, Pa., U.S.A. Dr. G. J. R. Miller, President. W. P. Buchanan, Vice-President. Dr. G. J. R. Miller, W. P. Buchanan, John N. Reeve, Benjamin L. Berry, H. E. Havens, Charles J. Cole, and Rudolph Pott, Board of Directors. John N. Reeve, 203 Walnut Place, Room 4, Philadelphia, Pa., Secretary and Treasurer.

Columbus (Ohio) Camera Club.—Established October 6, 1884. Rooms, Y.M.C.A. Building. Regular Meetings, third Thursday of each month except July and August at half-past Seven p.m. Annual Meeting, third Thursday of December. John Field, President. C. H. Doty, Vice-President. C. S. Bradley, Treasurer. W. B. Kimball, 32 East Spring Street, Columbus, Ohio, U.S.A., Secretary.

AMERICAN PHOTOGRAPHIC SOCIETIES—*Continued.*

Cortland Camera Club.—Established 1895. H. M. Alexander, 17 Clayton Street, Cortland, N.Y., U.S.A., Secretary and Treasurer.

Daguerre Camera Club.—Established 1891. Meetings held at 241 Wabash Avenue. W. Bradford, President. Wells B. Sizer, Oak Park, Ill., Secretary.

Delaware Camera Club.—Established 1891. Headquarters in its Club Rooms in the Equitable Building, Wilmington, Delaware. Regular Meetings are held on the first Thursday of each month. John M. Rogers, President. Miss Rachel S. Howland and Eva Elliott, Vice-Presidents. John C. Phillips 803 Franklin Street, Wilmington, Del., U.S.A., Secretary.

Detroit Lantern Club.—Established January, 1891. Meetings held at the Museum of Art, Hastings Street and Jefferson Avenue, Detroit, Mich. Frank E. Kirby, President. A. D. Noble, jun., Director. D. Farrand Henry, 52 Woodward Avenue, Detroit, Mich., U.S.A., Secretary and Treasurer.

Elizabeth Camera Club.—Established 1893. Meetings held at 96 Broad Street. D. R. Blackford, President. James A. Woodward, Vice-President. Dr. E. D. Frost, T. F. McCarty, J. G. Green, John Ball, E. W. Smith, A. P. Campbell, and A. N. Lakens, Committee. James A. Knowles, Treasurer. John Ball, 96 Broad Street, Elizabeth, N.J., Secretary.

Frankford Camera Club.—Established 1889. Meetings are held at the Wright's Industrial and Beneficial Institute, Frankford, Philadelphia, Pa. J. M. Justice, 5016 Penn Avenue, Frankford, Philadelphia, Pa., U.S.A., Secretary.

Hartford Scientific Society (Photographic Section).—Section Formed 1894. Meetings held at 25 Pratt Street, Hartford, Conn., U.S.A. Dr. G. L. Parmele, Chairman. A. S. Clark, Joseph Merrett, and Miss Grace Johnson, Committee. Louis W. H. Gradisky, 225 Capen Street, Hartford, Conn., U.S.A., Secretary and Treasurer.

Harvard Camera Club.—Established 1889. Headquarters, Harvard University, Cambridge, Mass. Annual meeting, June. Meetings monthly. P. P. Sharples, President. C. P. M. Rumford, Vice-President. Haven Emerson, Thayer, 63, Cambridge, Mass., U.S.A., Secretary and Treasurer.

Hoboken Camera Club.—Established March 22, 1889. The Regular Meetings of the Club take place the first Tuesday of each month. The Board of Governors meet the third Friday of each month. The Annual Meeting of the Club takes place the first Tuesday in March, when the election of officers takes place for the ensuing year. All Meetings are held at 1036 Park Avenue, Hoboken, N.J. A. J. Thomas, President. C. Sudhaus, Vice-President. Three Trustees (W. Schrader, A. Beyer, and E. E. Wooley), all the Officers of the Club, the House Committee (F. A. Muench), and the Entertainment Committee, Board of Governors. William Allen, Custodian. H. J. Kultenbach, Treasurer. A. L. Smith, 1045 Bloomfield Street, Hoboken, N.J., U.S.A., Secretary.

Irvington (N.J.) Art and Camera Club.—Established 1892. Meetings are held at Springfield and Union Avenues, Irvington, N.J., U.S.A. Edwin D. Harrison, President. F. H. Morrell, Vice-President. James Peckwell, jun., Treasurer. Melton Tompkins, Secretary.

Lawrence Camera Club.—Established 1893. Meetings held at Brachin Block, Lawrence, Mass. R. A. Hale, Lawrence, Mass., U.S.A., Secretary.

AMERICAN PHOTOGRAPHIC SOCIETIES—*Continued.*

Louisville Camera Club.—Established 1888. Meetings held at North-east corner of Fourth Avenue and Jefferson Street, Louisville, Ky. R. L. Stevens, 1100 West Main Street, Louisville, Ky., U.S.A., Secretary.

Lowell Camera Club.—Established 1889. Incorporated 1892. Meetings held at Central Block. Paul Butler, President. W. P. Atwood and F. T. Walsh, Vice-Presidents. The Officers, and Charles Runels, F. M. Goodhue, and Fay H. Martin, Committee. M. A. Taylor, Treasurer. George A. Nelson, 91 Mansur Street, Lowell, Massachusetts, Secretary.

Lynn Camera Club.—Established January 1, 1888. Incorporated December 20, 1889. Regular Meetings, first Tuesday in each month. Annual Meeting, first Tuesday in January. All Meetings held at the Club House, 42 Broad Street. William H. Drew, President. J. N. Smith, Vice-President. W. H. Drew, J. N. Smith, J. W. Gibboney, A. J. Purinton, E. F. Bacheller, A. H. Carsley, W. B. Gifford, and W. A. Pevear, Committee. E. F. Bacheller, Treasurer. C. A. Lawrence, Club House, 42 Broad Street, Lynn, Mass., Secretary.

Mattapan Camera Club.—Established May, 1890. Meetings held at the private residence of members. John A. Locklin, President. Walter Hertzberg, Vice-President. Walter Hertzberg, Treasurer. Erdmann Sonnenbrodt, P.O. Box 83, Mattapan, Mass., Secretary.

Memphis Camera Club.—Established 1893. Meetings held at the Y.M.C.A. Buildings. S. J. Latta, President. H. B. Belt, Vice-President. President, Vice-President, Secretary, and R. T. Hays and William Burlin, Committee. Walter L. Gray, Peabody Hotel, Memphis, Tenn., U.S.A., Secretary and Treasurer.

Minneapolis Camera Club.—Incorporated 1892. Meetings held at 15 North Fourth Street. W. B. Augir, President. W. H. McMullen, Vice-President. A. S. Williams, Treasurer. C. J. Hibbard, 17 South Fourth Street, Minneapolis, Minn., Secretary.

Mystic Camera Club.—Organized June 4, 1889. Incorporated March 17, 1891. Meetings held at 202 High Street, West Medford, Mass., U.S.A. Charles A. Smith, President. Warren M. Archibald, Vice-President. C. A. Smith, W. M. Archibald, C. A. Staniford, J. B. Thaxter, jun., C. A. Clark, William C. Eddy, and B. D. D. Bourne, Executive Board. Jos. B. Thaxter, jun., Treasurer. Charles A. Staniford, 87 Gilman Street, Somerville, Mass., U.S.A., Secretary.

Newark (N.J.) Camera Club.—Established April 18, 1888. Meetings are held at 224 Market Street, Newark, N.J. J. M. Foote, President. William Archibald, Vice-President. H. W. Smith, Treasurer. D. S. Plumb, 24 Boudinot Street, Newark, N.J., U.S.A., Secretary.

New Britain Camera Club.—Established 1892. Headquarters, 210 Main Street. Annual meeting, January. Meetings, second and fourth Tuesdays in each month. R. S. Brown, President. E. T. Porter, Vice-President. F. W. Wood, 273 Main Street, New Britain, Conn., U.S.A., Secretary and Treasurer.

New England Lantern Slide Exchange.—Membership limited to fifteen photographic societies, which furnish every year fifty slides each. W. C. Eddy, 3 Grove Street, Medford, Mass., U.S.A., Secretary.

AMERICAN PHOTOGRAPHIC SOCIETIES—*Continued.*

New Orleans Camera Club.—Established December 17, 1886. Meetings are held at 712 Union Street, New Orleans, La. Hon. Bernard C. Shields, President. W. Gowland, Vice-President. William Grimshaw, Treasurer. M. V. Haulard, 1729 Bienville Avenue, New Orleans, La., U.S.A., Secretary.

Newton Camera Club.—Established 1893. Meetings held at the Club House, Brookside Avenue, Newtonville, Mass., U.S.A. F. O. Stanley, President. Dr. E. B. Hitchcock, Vice President. T. M. Clark, Secretary.

New York Camera Club.—Established 1888. Meetings are held at 314 Fifth Avenue, New York. Samuel W. Bridgham, President. Franklin Harper, Vice-President. Robert J. Devlin, Treasurer. Chas. W. Stevens, M.D., 33 West Thirty-third Street, New York City, U.S.A., Secretary.

Old Colony (Rockland, Mass.) Camera Club.—Meetings at Smith Block, Liberty Street, on the first and third Fridays of every month. D. Smith, President. Emery H. Jenkins, Vice-President and Treasurer. D. Smith, Secretary.

Omaha Camera Club.—Established 1894. Meetings held at 1312 Farnam Street, Omaha, Neb. W. Durnall, 462 South Twenty-fourth Street, Omaha, Neb., U.S.A., Secretary.

Oneida Camera Club.—Established February, 1894. Meetings are held at P.O. Block, Oneida, N.Y. B. S. Teale, President. E. R. Hanson, Vice-President. Albert Dygett, Treasurer. E. R. McDougall, Oneida, N.Y., U.S.A., Secretary.

Orange (N.J.) Camera Club.—Established 1892. Meetings held at 220 Main Street. W. H. Cheney, President. E. H. Graves, Vice-President. Charles A. Lindsley, Treasurer. Alfred C. Bode, 359 Main Street, Orange, N.J., U.S.A., Secretary.

Oregon Camera Club.—Established 1895. Meetings are held at 127½ First Street, Portland, Ore. A. Hertzman, P. O. Box 936, Portland, Ore., U.S.A., Secretary.

Paterson Camera Club.—Established 1893. Meetings are held at 9 Lake Street. C. M Giles, President. H. W. Gledhill, Vice-President. Wm. M. Moore, Treasurer. Chas. D. Cooke, Cooke Locomotive Works, Paterson, N.J., U.S.A., Secretary.

Photographers' Association of America.—Next meeting will be held at Chautauqua, Jamestown, N.Y. C. M. Hayes, President. J. William Kellmer, First Vice-President. W. J. Thuss, Second Vice-President. C. M. Hayes, J. William Kellmer, W. J. Thuss, George Varney, and A. L. Bowersox, Executive Committee. George Varney, Treasurer. A. L. Bowersox, Dayton, Ohio, Secretary.

Photographers' Association of Iowa.—Established 1889. Meetings held at Des Moines, Iowa. W. C. Edinger, President. F. J. McMullen, First Vice-President. R. A. Gardner, Second Vice-President. Theo. A. Brown, Treasurer. J. R. Hall, Monroe, Iowa, U.S.A., Secretary.

AMERICAN PHOTOGRAPHIC SOCIETIES—*Continued.*

Photographers' Association of Missouri.—Established 1894. Meetings at Perth Springs, Mo., 1897. William Latour, President. O. L. Hutchins, First Vice-President. E. D. Fear, Second Vice-President. The President, Vice-Presidents, Secretary, and Treasurer, Executive Committee. Ellsworth Marks, Treasurer. A. S. Robertson, St. Louis, Mo., Secretary. Mr. Stone, Warrensburg, Mo., Assistant Secretary.

Photographers' Association of Ohio.—Office of Executive Committee, Hamilton, Ohio. A. L. Bowersox, President. George H. Barnum, Springfield, Ohio, U.S.A., Secretary.

Photographical Section of the American Institute.—Established 1859. Meetings are held at 111, 113, 115 West Thirty-eighth Street, New York City. Oscar G. Mason, President. Robert A. B. Dayton, Vice-President. The Officers of the Section, Executive Committee. William Dean, Treasurer. J. W. Bartlett, M.D., 149 West Ninety-fourth Street, New York City, Secretary.

Photographic Club of Baltimore City (Md.).—Established May, 1891. Meetings are held at Madison and Eutaw Streets, Baltimore City, Md. A. S. Murray, President. Dr. Frank Slothower, Vice-President. A. S. Murray, Dr. F. Slothower, A. J. Godby, F. W. McAllister, B. G. Buck, E. M. Barker, and Charles E. Needles, Board of Directors. E. M. Barker, Treasurer. Charles E. Needles, 404 Cathedral Street, Baltimore, Md., Secretary.

Photographic Society of Philadelphia.—Established November, 1862. Meetings held at 10 South Eighteenth Street, Philadelphia, Pa., U.S.A. Joseph H. Burroughs, President. Charles R. Pancoast and Robert S. Redfield, Vice-Presidents. The Officers, and John C. Browne, John G. Bullock, Samuel Castner, jun., J. Hunter Ewing, F. William Geisse, Alexander Hemsley, William N. Jennings, Albert B. Parvin, William H. Rau, Anthony W. Robinson, Samuel Sartain, and Benjamin Sharp, M.D., Directors. George Vaux, jun., Treasurer. Edmund Stirling, 4517 Kingsessing Avenue, West Philadelphia, Secretary.

Pittsburg (Pa.) Amateur Photographers' Society.—Established 1886. Incorporated 1896. Meetings held at the Pittsburgh Carnegie Library. C. C. Craft, President. E. E. Kellar, Vice-President. C. C. Craft. E. E. Kellar, W. S. Clow, A. R. Neeb, H. L. Christy, W. J. Boston, W. J. Hunker, and J. H. Hunter, Board of Trustees. W. J. Hunker, Treasurer. Joseph H. Hunter, 520 Green Street, Pittsburg, Pa., U.S.A., Secretary.

Pittsfield Camera Club.—Established 1892. Meetings held at Pittsfield, Mass., on the second Wednesday in each month. C. E. Tompkins, President. R. B. Johnson, Vice-President. Allen H. Bagg, Treasurer. J. S. Colton, Pittsfield, Mass., U.S.A., Secretary.

Plainfield (N.J.) Camera Club.—Established June 7th, 1888. Incorporated September 7th, 1890. Meetings held at the Rooms in Babcock Building, West Front Street. Oscar S. Teale, President. H. Y. Stillman, Vice-President. W. H. Freeman, Treasurer. Harry H. Coward, 245 East Front Street, Plainfield, N.J., Secretary.

Portland (Maine) Camera Club.—Established 1891. Meetings held at the Club Rooms. A. S. Gilson, President. C. T. Whipple, Treasurer. Frederick H. Collins, 92 Preble Street, Portland, Maine, Secretary.

AMERICAN PHOTOGRAPHIC SOCIETIES—*Continued.*

Postal Photographic Club.—Established December, 1888. Wilfred A. French, President. F. E. Fairbanks Fitchburg, Mass., Secretary and Treasurer.

Providence Camera Club.—Established 1883. Incorporated 1889. Meetings are held at 87 Weybosset Street, Providence, R.I. R. Clinton Fuller, President. W. Penn Mather, Vice-President. R. Clinton Fuller, Frederick P. Wilbur, Edmund A. Darling, J. Eliot Davison, Charles A. Stoddard, W. A. Dean, F. C. Hodgman, J. A. Miller, jun., and S. B. Burnhame, Executive Committee. E. A. Darling, Treasurer. F. P. Wilbur, Recording Secretary. J. Eliot Davison, 112 Cross Street, Central Falls, R.I., Corresponding Secretary.

Putnam (Conn.) Camera Club.—Established January, 1888. Headquarters at its Club Rooms, Putnam, Connecticut. Regular Meetings are held on the first Friday in each month. The Annual Field Day occurs on the first Wednesday in June. George E. Dresser, President. Edward F. Whitmore, Treasurer. Eric H. Johnson, Putnam, Connecticut, U.S.A., Secretary.

San Diego (Cal.) Camera Club.—Established 1892. Meetings are held at D Street between Fourth and Fifth Streets. Dr. Joseph Rhodes, President. Charles Wellborn, Vice-President. Miss Laura B. Anderson, Treasurer. W. W. Whiston, 1934 Fourth Street, San Diego, Cal., U.S.A., Secretary.

Schuylkill Camera Club.—Established July 5, 1889. Meetings are held at Sheafer Office Building. A. W. Sheafer, President. Miss Elena Roads, Vice-President. The Officers, Committee. W. L. Sheafer, Treasurer. B. S. Simonds, 400 Mahantongo Street, Pottsville, Pa., Secretary.

Society of Amateur Photographers of New York.—Established March 10, 1884. Meetings are held at 113 West Thirty-eighth Street. C. C. Roumage, President. Dr. J. H. Stebbins, jun., Vice-President. Dr. J. T. Nagle, E. T. Birdsall, Albert Stetson, Louis T. Brush, C. W. Canfield, Harry Coutant, G. F. Basset, and Frank M. Hale, Board of Directors. W. E. Johnson, Treasurer. R. L. Bracklow, Recording Secretary. T. J. Burton, 113 West Thirty-eighth Street, New York City, U.S.A., Corresponding Secretary.

Springfield (Mass.) Camera Club.—Established October, 1886. Meetings are held at the Club Rooms, corner of Main and Dwight Streets. Henry C. Haile, President. Henry C. Haile, William M. Lester, Charles C. McElwain, William B. Sleigh, and William P. Draper, Executive Committee. William B. Sleigh, Librarian. William M. Lester, Treasurer. Charles C. McElwain, 43 Federal Street, Springfield, Mass., U.S.A., Secretary.

Stevens (Hoboken, N.J.) Photographic Society.—Established 1889. Meetings held at the Stevens Institute of Technology, on the first week in each month. Robert E. Hall, President. E. N. Wood, Vice-President. H. S. L. Verley, Treasurer. M. H. Maxfield, 95 Stevens Institute of Technology, Hoboken, N.J., U.S.A., Secretary.

St. Louis Camera Club.—Established 1885. Meetings held at 911 North Vandeventer Avenue. Walter H. Wilcox, President. M. T. Corwin, Vice-President. Charles M. Alexander, Chairman of the Lantern Slide Committee. H. B. Alexander, 4028 Westminster Place, St. Louis, Mo., U.S.A., Secretary and Treasurer.

AMERICAN PHOTOGRAPHIC SOCIETIES—*Continued.*

St. Louis Photographic Society.—Established December, 1895. Meetings held at the Club Rooms, Y.M.C.A. Building. Robert E. M. Bain, President. John W. Dunn, Vice-President. Robert E. M. Bain (Chairman), John W. Dunn, R. E. Collins, William A. Haren, and John D. Elliott, Committee. John D. Elliott, 414 North Fourth Street, St. Louis, Mo., Secretary and Treasurer.

St. Paul Camera Club.—Established 1892. Meetings are held at corner of Third and Jackson Street, St. Paul, Minn. James Paris, President. D. F Brown, Vice-President. W. B. Thorne, Treasurer. W. J. Sonnen, Third and Jackson Street, St. Paul, Minn., U.S.A., Secretary.

Sunny Side Camera Club.—Established 1891. Meetings are held at 5900 South Broadway, St. Louis, Mo. Professor William A. Bricner, 1235 South Broadway, St. Louis, Mo., U.S.A., Secretary.

Syracuse Camera Club.—Organized October, 1886. Incorporated January 19, 1892. Meetings held at Butler Block, 322 South Salina Street, Syracuse, N.Y. Herbert F. Smith, President. George E. Timmins, Vice-President. The President, Vice-President, Secretary, Treasurer, and S. W. Rose, Dr. A. Clifford Mercer, F. J. Schnauber, and F. L. Barnes, Board of Directors. Leray Eldredge, Treasurer. Frederick W. Field, 322 South Salina Street, Syracuse, N.Y., U.S.A., Secretary.

Tech Camera Club.—Established September, 1889. Meetings, bi-monthly, at half-past seven p.m., in the Boynton Hall of the Polytechnic Institute, Worcester, Mass. Dark room and Printing room also at Boynton Hall. The purpose of the Meetings is to discuss photographic subjects and, as far as possible, to diffuse a knowledge of the science and art among the members of the Institute. The Executive Committee transact all business connected with the Club. H. J. Fuller, President. A. J. Smith, Vice-President. J. W. Higgins, Boynton Hall, Worcester Polytechnic Institute, Worcester, Mass., Treasurer and Secretary.

Technology Photographic Society.—Established 1893. Meetings are held at Massachusetts Institute of Technology, Boyleston Street, Boston, Mass. Herman A. Poppenhusen, President. Welles M. Partridge, Vice-President. President, Vice-President, Secretary, Treasurer, and Frederick Kleinschmidt, Committee. Arthur C. Lawley, Treasurer. E. Johnson Loring, Mass. Inst. Tech., Boston, Mass., Secretary.

Waterbury Photographic Society.—Meetings held at Brown's Block, South Main Street, on the first and third Tuesdays in each month. H. T. Stedman, President. L. S. White, Vice-President. William M. Hodges, Treasurer. George H. Ward, 14 Division Street, Waterbury, Conn., U.S.A., Secretary.

Watertown (N. Y.) Camera Club.—Meetings held at 4 Paddock Arcade, Watertown, N.Y. A. R. Wilson, President. George Mowe, Treasurer. C. A. Wilson, 2½ Public Square, Watertown, N.Y., U.S.A., Secretary.

Worcester Camera Club.—Re established 1892. Meetings held at Walker Building, 405 Main Street, Worcester, Mass. Daniel F. Gay, 214 Main Street, Worcester, Mass., U.S.A., Secretary.

Young Ladies' Camera Club.—Established 1895. Meetings are held at Y.W.C.A. Rooms, 808 Nicollet Avenue, Minneapolis, Minn. Miss M. E. McIntyre, 1823 Portland Avenue, Minneapolis, Minn., U.S.A., Secretary.

THE PHOTOGRAPHIC COPYRIGHT UNION.

The following are the rules as amended at the General Meeting, November 22nd, 1895.

Committee.

President, Frank Bishop (Marion & Co.). *Vice-President*, Joseph J. Elliott (Elliott & Fry, Baker Street). *Treasurer*, Wm. Grove (Window & Grove, Baker Street). *Hon. Secretary*, J. Lillie Mitchell (London Stereoscopic Co., Ld.), 54 Cheapside, London, E.C. Wm. Downey (W. & D. Downey, Ebury Street), Alfred Ellis (Upper Baker Street), E. Frith (Frith & Co., Reigate), Jas. Lafayette (Dublin), Louis Wilson (G. W. Wilson & Co., Ld., Aberdeen), Warwick Brookes (Manchester), J. W. McGrath (Cork), F. M. Sutcliffe (Whitby). *Solicitors*, Messrs. Neish, Howell, & Macfarlane, 66 Watling Street, London, E.C. *Secretary*, Henry Gower, Photographic Section, London Chamber of Commerce, Botolph House, Eastcheap, London, E.C.

Title.

I.—The name of the Society shall be the 'Photographic Copyright Union.'

Objects.

II.—The objects of the Union shall be to secure and protect Photographic Copyrights, to suppress piracies, and generally to promote the interests of the profession.

Membership.

III.—Photographers who have given their signed adherence to the Union shall be considered duly elected, and all professional and amateur photographers and photographic publishers shall be qualified to become Members of the Union under the rules, provided they be introduced by a Member.

IV.—The Committee shall have the power of nominating as Honorary Members, free from any subscription, any persons resident abroad or in the colonies, whom they may in their discretion select as corresponding Agents for the Union.

Funds.

V.—There shall be a Donation Fund and a Reserve Fund. The Donation Fund shall be deposited in the name of the Union, and cheques drawn therefrom as per Rule XI. The Reserve Fund shall be deposited at the Bankers in the joint names of the President and Treasurer of the Union, and only in the event of a deficiency in the Donation Fund shall expenses be defrayed out of the Reserve Fund.

VI.—There shall be no Annual Subscription.

VII.—The Working Expenses of the Union shall be met by Voluntary Donations.

Reserve Fund.

VIII.—A Reserve Fund shall be created, to consist of Voluntary Donations and of such other funds as may be found available for the purpose.

OFFICERS.

IX.—The management of the Union shall be by a Committee of nine Members (but with power to increase their number), two of whom shall retire annually, but shall be eligible for re-election. The Committee shall elect annually from among themselves a President, a Vice-President, and a Treasurer, and the Committee shall be Members of the Photographic Trade Section of the London Chamber of Commerce.

X.—The mode of Election of Members of the Committee shall be by the vote of the General Members of the Union.

XI.—The Bankers of the Union shall be the National Provincial Bank of England, St. Marylebone Branch, Baker Street, W. All cheques shall be signed by the Treasurer, and a Member of the Committee, and counter-signed by the Secretary.

XII.—The Standing Counsel, Solicitors, and Secretary of the Union shall be appointed by the Committee, and shall hold office for such time and upon such terms as may be determined by the Committee. No Member of the Committee shall be eligible as Auditor.

MEETINGS OF COMMITTEE.

XIII.—The Committee shall meet monthly on the first Wednesday in each month, but a Meeting may be called by the Secretary, upon the request of any two Members of the Committee. Three clear days at least must elapse between the issue of the notices (unless the Secretary shall mark them 'very urgent') and the day for which the Meeting is called.

XIV.—Five shall form a quorum of the Committee, except where otherwise hereinafter provided. Questions arising at any Meeting of the Committee shall be decided by a majority of votes, and, in case of an equality of votes, the Chairman of the Meeting shall, in addition to his original vote, have a casting vote.

ACCOUNTS.

XV.—Proper books of account shall be kept at the offices of the Union, and all such accounts shall be audited by the Auditors once in every year, and oftener if the Committee shall so determine. The Auditors shall be elected by the Members of the Union present at the General Meeting. All moneys received by the Secretary shall be paid to the Treasurer within seven days.

GENERAL MEETINGS.

XVI.—A General Meeting of the Union shall be held in the month of October in each year, and of such Meeting seven days' notice shall be sent to each Member, together with the report (if any) of the Committee, and an abstract or short statement of the accounts of the Union, together with a note of any alterations of and additions to the Rules that may be proposed. Extraordinary General Meetings shall be summoned at any time, upon the requisition of twenty Members of the Union. At any such Meeting the Rules of the Union may be added to or altered by the vote of two-thirds of the Members present, provided that fourteen days' prior notice has been given to the Secretary stating the proposed additions or alterations. Fifteen Members shall form a quorum at such Meetings, and the Chairman shall have a casting vote.

Work of the Union.

XVII.—The Society will undertake to register the work of any Member who desires them to do so upon the payment of 1*s.* 6*d.*, which is inclusive of the fee of 1*s.* at Stationers' Hall, but the Union shall incur no responsibility in case any such registration shall be held to be defective by any Court of Law.

XVIII.—Any Member shall have the privilege of referring the application of any Publisher or other person, who may desire to copy his works, to the Secretary to arrange terms for the same. A record will be kept of all licences and permissions negotiated by the Union, who shall be entitled to charge a commission of ten per cent. on all sums obtained by them in this manner for a Member.

XIX.—Members whose work has been infringed, and who wish the Union to obtain redress for them, must send the Secretary an original photograph, the piracy complained of, a copy of the registration form, the place and date of purchase of the piracy, and the name and address of the person by whom purchased, together with all correspondence that may have any reference to the piracy in question. The Secretary, having satisfied himself and any one Member of the Committee that the essential preliminaries to registration have been duly observed, shall then submit the case to the Solicitor, who will advise the Secretary upon it. A quorum of three of the Committee shall have power to give the Solicitor authority to proceed, but in urgent cases an action may be commenced by the Solicitor, should he deem it advisable, before the Committee have time to sit, but not before obtaining the written authority of the Member or Members interested, and in such cases, until the action of the Solicitor be ratified by three Members of the Committee, the Union shall not be liable for any costs.

XX.—If when a case, at the request of a Member, has been conducted by the Union, and compensation by way of penalties, or damages, or otherwise, be obtained, the net proceeds shall be divisible as follows: Two-thirds shall go to the Member whose copyright has been infringed, and one-third to the Reserve Fund of the Union. If no damages are obtained, then the expenses shall be borne as follows: Fifty per cent. shall be paid to the Union by the Member on whose behalf the action was taken, and thereafter fifty per cent. by the Union.

XXI.—In all cases where the aid of the Union has been invoked, and compensation obtained for a Member without litigation, the Union shall deduct twenty-five per cent. of the amount obtained after deducting expenses, and shall pay the balance to the Member.

XXII.—That the Committee shall have the power, should they deem it advisable, to give such rewards as they shall agree upon to any one who gives such information as shall lead to the conviction of an offender, or to successful litigation.

XXIII.—That no Member shall allow a Copyright picture belonging to him to be reproduced (whether registered or not) for a less fee than 10*s.* 6*d.* on each occasion, and for each different publication or form in which it is used, but he shall be at liberty to charge a larger fee, according to his own ideas as to its value.

XXIV.—That Members be invited to seek advice and information of the Union through the Secretary, which shall be given free of charge.

XXV.—That the Society will assist Members in assigning Copyrights, and help them in every possible way in all matters relating to Copyrights.

The following are—

COPIES OF FORMS ISSUED BY THE PHOTOGRAPHIC COPYRIGHT UNION.

[**2d. per dozen.**—*Prices include Postage.*]

FORM A.]

Photographic Section of the London Chamber of Commerce.

BOTOLPH HOUSE, EASTCHEAP.

Photographic Copyright Union.

In reply to your request for permission to copy my photograph of...I beg to state that, being a Member of the above Photographic Copyright Union, I am bound by its regulations to make a charge for the permit required. My fee in this case will be..................and on receipt of this amount I will forward you official permission. ....

....

NOTICE.—Any one copying my photographs for the purposes of reproduction or illustration either in Newspaper, Magazine, Book, or any other form, without first obtaining my permission, render themselves liable to an action for infringement of my copyright.

FORM B.] Receipt granting permission to use Copyright Photographs.

Issued by the Photographic Copyright Union.

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In consideration of the sum of....................hereby acknowledged, you are authorised to reproduce, by........................process, my Copyright Photograph of...in any size not exceeding..........................
my name to be printed under each impression.

This Permission and Fee is for reproduction in..and for one issue only, and the subject may not be reproduced or sold as an independent illustration separate from the above publication and its accompanying letterpress. If any other use is desired, a fresh Permission and Payment is required. ....

NOTICE.—Any one copying my photographs for the purposes of reproduction or illustration either in Newspaper, Magazine, Book, or any other form, without first obtaining my permission, render themselves liable to an action for infringement of my copyright.

FORM C.] Receipt granting permission to use Copyright Photographs.

Issued by the Photographic Copyright Union.

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.........*day of*.......................189...

In consideration of the sum of....................*hereby acknowledged, you are authorised to reproduce, by*.......................*process, our Copyright Photograph of*...*in any size not exceeding*...................... *our name to be printed under each impression.*

This Permission and Fee is for reproduction in...................................... *and for one issue only, and the subject may not be reproduced or sold as an independent illustration separate from the above publication and its accompanying letterpress. If any other use is desired, a fresh Permission and Payment is required.*

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NOTICE.—Any one copying our photographs for the purposes of reproduction or illustration either in Newspaper, Magazine, Book, or any other form, without first obtaining our permission, render themselves liable to an action for infringement of our copyright.

[For the information of those interested in the law of copyright, the Act relating thereto is reproduced in the following pages.]

THE COPYRIGHT (WORKS OF ART) ACT (1862).

An Act for amending the Law relating to Copyright in Works of the Fine Arts, and for repressing the Commission of Fraud in the Production and Sale of such Works.

WHEREAS by law, as now established, the authors of paintings, drawings, and photographs, have no copyright in such their works, and it is expedient that the law should in that respect be amended: Be it therefore enacted by the Queen's Most Excellent Majesty, by and with the advice and consent of the Lords spiritual and temporal, and Commons, in this present Parliament assembled, and by the authority of the same, as follows:—

Copyright in Works Hereafter Made or Sold to Vest in the Author for his Life, and for Seven Years after his Death.

1. The author, being a *British* subject or resident within the dominions of the Crown, of every original painting, drawing, and photograph which shall be or shall have been made either in the *British* dominions or elsewhere, and which shall not have been sold or disposed of before the commencement of this Act, and his assigns, shall have the sole and exclusive right of copying, engraving, reproducing, and multiplying such painting or drawing, and the design thereof, or such photograph, and the negative thereof, by any means and of any size, for the term of the natural life of such author, and seven years after his death; provided that when any painting or drawing, or the negative of any photograph, shall for the first time after the passing of this Act be sold or disposed of, or shall be made or executed for or on behalf of any other person for a good or a valuable consideration, the person so selling or disposing of or making or executing the same shall not retain the copyright thereof, unless it be expressly reserved to him by agreement in writing, signed, at or before the time of such sale or disposition, by the vendee or assignee of such painting or drawing, or of such negative of a photograph, or to the person for or on whose behalf the same shall be so made or executed, but the copyright shall belong to the vendee or assignee of such painting or drawing, or of such negative of a photograph, or to the person for or on whose behalf the same shall have been made or executed; nor shall the vendee or assignee thereof be entitled to any such copyright, unless, at or before the time of such sale or disposition, and agreement in writing, signed by the person so selling or disposing of the same, or by his agent duly authorised, shall have been made to that effect.

Copyright not to Prevent the Representation of the Same Subjects in Other Works.

2. Nothing herein contained shall prejudice the right of any person to copy or use any work in which there shall be no copyright, or to represent any scene or object, notwithstanding that there may be copyright in some representation of such scene or object.

Assignments, Licenses, &c., to be in Writing.

3. All copyright under this Act shall be deemed personal or moveable estate, and shall be assignable at law, and every assignment thereof, and every license to use or copy by any means or process the design or work which shall be the subject of such copyright, shall be made by some note or memorandum in writing, to be signed by the proprietor of the copyright, or by his agent appointed for that purpose in writing.

Register of Proprietors of Copyrights in Paintings, Drawings, and Photographs to be kept at Stationers' Hall, as in 5 & 6 Vict., cap. 45.

4. There shall be kept at the Hall of the Stationers' Company, by the Officer appointed by the said Company for the purposes of the Act passed in sixth year of Her present Majesty, intituled *An Act to Amend the Law of Copyright*, a book or books, entitled 'The Register of Proprietors of Copyright in Paintings, Drawings, and Photographs,' wherein shall be entered a memorandum of every copyright to which any person shall be entitled under this Act, and also of every subsequent assignment of any such copyright; and such memorandum shall contain a statement of the date of such agreement or assignment, and of the names of the parties thereto, and of the name and place of abode of the person in whom such copyright shall be vested by virtue thereof, and of the name and place of abode of the author of the work in which there shall be such copyright, together with a short description of the nature and subject of such work and in addition thereto, if the person registering shall so desire, a sketch, outline, or photograph of the said work, and no proprietor of any such copyright shall be entitled to the benefit of this Act until such registration, and no action shall be sustainable nor any penalty recoverable in respect of anything done before registration.

Certain Enactments of 5 and 6 Vict., c. 45, to Apply to the Books to be Kept under this Act.

5. The several enactments in the said Act of the sixth year of Her present Majesty contained, with relation to keeping the register book thereby required, and the inspection thereof. the searches therein, and the delivery of certified and stamped copies thereof, the reception of such copies in evidence, the making of false entries in the said book, and the production in evidence of papers falsely purporting to be copies of entries in the said book, the application to the Courts and Judges by persons aggrieved by entries in the said book, and the expunging and varying such entries, shall apply to the book or books to be kept by virtue of this Act, and to the entries and assignments of copyright and proprietorship therein under this Act, in such and the same manner as if such enactments were here expressly enacted in relation thereto, save and except that the forms of entry prescribed by the said Act of the sixth year of Her present Majesty may be varied to meet the circumstances of the case, and that the sum to be demanded by the officer of the said Company of Stationers for making any entry required by this Act shall be one shilling only.

Penalties on Infringement of Copyright.

6. If the author of any painting, drawing, or photograph in which there shall be subsisting copyright, after having sold or disposed of such

copyright, or if any other person, not being the proprietor for the time being of copyright in any painting, drawing, or photograph, shall, without the consent of such proprietor, repeat, copy, colourably imitate, or otherwise multiply for sale, hire, exhibition, or distribution, or cause or procure to be repeated, copied, colourably imitated, or otherwise multiplied for sale, hire, exhibition, or distribution, any such work or the design thereof, or, knowing that any such repetition, copy, or other imitation has been unlawfully made, shall import into any part of the United Kingdom, or sell, publish, let to hire, exhibit, or distribute, or offer for sale, hire, exhibition, or distribution, or cause or procure to be imported, sold, published, let to hire, distributed, or offered for sale, hire, exhibition, or distribution, any repetition, copy, or imitation of the said work, or of the design thereof, made without such consent as aforesaid, such person for every such offence shall forfeit to the proprietor of the copyright for the time being a sum not exceeding ten pounds; and all such repetitions, copies, and imitations, made without such consent as aforesaid, and all negatives of photographs made for the purpose of obtaining such copies, shall be forfeited to the proprietor of the copyright.

Penalties on Fraudulent Productions and Sales.

7. No person shall do or cause to be done any or either of the following Acts: that is to say,—

First, no person shall fraudulently sign or otherwise affix, or fraudulently cause to be signed or otherwise affixed, to or upon any painting, drawing, or photograph, or the negative thereof, any name, initials, or monogram:

Secondly, no person shall fraudulently sell, publish, exhibit, or dispose of, or offer for sale, exhibition, or distribution, any painting, drawing, or photograph, or negative of a photograph, having thereon the name, initials, or monogram of a person who did not execute or make such work:

Thirdly, no person shall fraudulently utter, dispose, or put off, or cause to be uttered or disposed of, any copy or colourable imitation of any painting, drawing, or photograph, or negative of a photograph, whether there shall be subsisting copyright therein or not, as having been made or executed by the author or maker of the original work from which such copy or limitation shall have been taken.

Fourthly, where the author or maker of any painting, drawing, or photograph, or negative of a photograph, made either before or after the passing of this Act, shall have sold or otherwise parted with the possession of such work, if any alteration be afterwards made therein by any other person, by addition or otherwise, no person shall be at liberty, during the life of the author or maker of such work, without his consent, to make or knowingly to sell or publish, or offer for sale, such work or any copies of such work so altered as aforesaid, or of any part thereof, as or for the unaltered work of such author or maker.

Penalties.

Every offender under this section shall, upon conviction, forfeit to the person aggrieved a sum not exceeding ten pounds, or not exceeding double the full price, if any, at which all such copies, engravings,

imitations, or altered works shall have been sold or offered for sale; and all such copies, engravings, imitations, or altered works shall be forfeited to the person, or the assigns, or legal representatives of the person whose name, initials, or monogram shall be so fraudulently signed or affixed thereto, or to whom such spurious or altered work shall be so fraudulently or falsely ascribed as aforesaid: Provided always, that the penalties imposed by this section shall not be incurred unless the person whose name, initials, or monogram shall be so fraudulently signed or affixed, or to whom such spurious or altered work shall be so fraudulently or falsely ascribed as beforesaid, shall have been living at or within twenty years next before the time when the offence may have been committed.

Recovery of Pecuniary Penalties.

8. All pecuniary penalties which shall be incurred, and all such unlawful copies, imitations, and all other effects and things as shall have been forfeited by offenders, pursuant to this Act, and pursuant to any Act for the protection of copyright engravings, may be recovered by the person hereinbefore and in any such Act as aforesaid empowered to recover the same respectively, and hereinafter called the complainant or the complainer, as follows:

In *England* and *Ireland*, either by action against the party offending or by summary proceeding before any two Justices having jurisdiction where the party offending resides:

In *Scotland*, by action before the Court of Session in ordinary form, or by summary action before the Sheriff of the County where the offence may be committed or the offender resides, who, upon proof of the offence or offences, either by confession of the party offending or by the oath or affirmation of one or more credible witnesses, shall convict the offender, and find him liable to the penalty or penalties aforesaid, as also in expenses; and it shall be lawful for the Sheriff, in pronouncing such judgment for the penalty or penalties and costs, to insert in such judgment a warrant, in the event of such penalty or penalties and costs not being paid, to levy and recover the amount of the same by poinding: Provided always, that it shall be lawful to the Sheriff, in the event of his dismissing the action and assoilzieing the defender, to find the complainer liable in expenses, and any judgment as to be pronounced by the Sheriff in such summary application shall be final and conclusive, and not subject to review by advocation, suspension, reduction, or otherwise.

Superior Courts of Record in which any Action is Pending may Make an Order for an Injunction, Inspection, or Account.

9. In any action in any of Her Majesty's Superior Courts of Record at *Westminster* and in *Dublin*, for the infringement of any such copyright as aforesaid, it shall be lawful for the Court in which such action is pending, if the Court be then sitting, or if the Court be not sitting then, for a judge of such Court, on the application of the plaintiff or defendant respectively, to make such order for an injunction, inspection, or account, and to give such direction respecting such action, injunction, inspection, or account, and the proceedings therein respectively, as to such Court or Judge may seem fit.

Importation of Pirated Works Prohibited.—Application in such Cases of Customs Act.

10. All repetitions, copies, or imitations of paintings, drawings, or photographs, wherein or in the design whereof there shall be subsisting copyright under this Act, and all repetitions, copies, and imitations of the design of any such painting or drawing, or of the negative of any such photograph, which, contrary to the provisions of this Act, shall have been made in any Foreign State, or in any part of the *British* dominions, are hereby absolutely prohibited to be imported into any part of the United Kingdom except by or with the consent of the proprietor of the copyright thereof, or his agent authorised in writing; and if the proprietor of any such copyright, or his agent, shall declare that any goods imported are repetitions, copies, or imitations of any such painting, drawing, or photograph, or of the negative of any such photograph, and so prohibited as aforesaid, then such goods may be detained by the Officers of Her Majesty's Customs.

Saving of Right to Bring Action for Damages.

11. If the author of any painting, drawing, or photograph, in which there shall be subsisting copyright, after having sold or otherwise disposed of such copyright, or if any other person, not being the proprietor for the time being of such copyright, shall, without the consent of such proprietor, repeat, copy, colourably imitate, or otherwise multiply, or cause to procure to be repeated, copied, or colourably imitated, or otherwise multiplied, for sale, hire, exhibition, or distribution, any such work or the design thereof, or the negative of any such photograph, or shall import or cause to be imported into any part of the United Kingdom, or sell, publish, let to hire, exhibit, or distribute, or offer for sale, hire, exhibition, or distribution, or cause or procure to be sold, published, let to hire, exhibited, or distributed, or offered for sale, hire, exhibition, or distribution, any repetition, copy, or imitation of such work, or the design thereof, or the negative of any such photograph, made without such consent as aforesaid, then every such proprietor, in addition to the remedies hereby given for the recovery of any such penalties, and forfeiture of any such things as aforesaid, may recover damages by and in a special action on the case, to be brought against the person so offending, and may in such action recover and enforce the delivery to him of all unlawful repetitions, copies, and imitations, and negatives of photographs, or may recover damages for the retention or conversion thereof: Provided that nothing herein contained, nor any proceeding, conviction, or judgment, for any act hereby forbidden, shall effect any remedy which any person aggrieved by such Act may be entitled to either at law or in equity.

Provisions of 7 *&* 8 *Vict.*, *c.* 12, *to be Considered as Included in this Act.*

12. This Act shall be considered as including the provisions of the Act passed in the Session of Parliament held in the seventh and eighth years of Her present Majesty, intituled *An Act to Amend the Law relating to International Copyright*, in the same manner as if such provisions were part of this Act.

RATES OF POSTAGE FOR INLAND LETTERS.

THE rates of postage to be prepaid are as follow, viz.:—

For a letter not exceeding 1 oz.							1*d.*
,,	exceeding	1 oz.,	but not exceeding		2	ozs.	1½*d.*
,,	,,	2	,,	,,	4	,,	2*d.*
,,	,,	4	,,	,,	6	,,	2½*d.*
,,	,,	6	,,	,,	8	,,	3*d.*
,,	,,	8	,,	,,	10	,,	3½*d.*
,,	,,	10	,,	,,	12	,,	4*d.*
,,	,,	12	,,	,,	14	,,	4½*d.*

And so on at the rate of ½*d.* for every additional two ounces.

INLAND PARCEL POST.

EVERY Post Office is open to the public for Parcel Post business on Week Days during the same hours as for general postal business. On Sundays Parcel Post business is not transacted.

RATES OF POSTAGE AND WEIGHT.—Three-halfpence for each pound after the first, which is threepence.

PREPAYMENT OF POSTAGE.—All parcels must be prepaid. LIMITATION OF WEIGHT.—No Parcel exceeding 11 lbs. in weight can be received for transmission by Parcel Post. LIMITATION OF SIZE.—No Parcel may exceed 3 ft. 6 in. in length, or 6 ft. in length and girth combined. POSTING OF PARCELS.—Parcels must be handed in at a Post Office Counter, and must not be dropped into a Letter Box.

WEIGHTS AND MEASURES.

APOTHECARIES' WEIGHT.

SOLID MEASURE.

20 Grains	= 1 Scruple	=	20 Grains.
3 Scruples	= 1 Drachm	=	60 ,,
8 Drachms	= 1 Ounce	=	480 ,,
12 Ounces	= 1 Pound	=	5760 ,,

FLUID.

60 Minims	= 1 Fluid Drachm.
8 Drachms	= 1 Ounce.
20 Ounces	= 1 Pint.
8 Pints	= 1 Gallon.

The above weights are those usually adopted in formulæ.

All Chemicals are usually sold by Avoirdupois Weight, in which there are 437½ grains to the ounce.

The Precious Metals, such as Silver and Gold, are sold by Troy Weight, containing 480 grains to the ounce.

FRENCH WEIGHTS AND MEASURES,

AND THEIR EQUIVALENTS IN ENGLISH.

1 Cubic Centimètre	= 17 minims nearly.
3½ ,, ,,	= 1 drachm.
28·4 ,, ,,	= 1 ounce.
50 ,, ,,	= 1 ounce, 6 drachms, 5 minims.
100 ,, ,,	= 3 ounces, 4 drachms, 9 minims.
1000 ,, ,, or 1 litre, = to 61 cubic inches	= 35 ounces, 1 drachm, 36 minims.

The unit of French liquid measures is a cubic *centimètre*.

A cubic *centimètre* of water measures nearly 17 minims (16·896); it weighs 15·4 grains, or 1 *gramme*. A cubic *inch* of water weighs 252·5 grains.

The unit of French weights is the gramme = 15·4 grains; thus a drachm (60 grains) is nearly 4 grammes (3·88). An easy way to convert grammes into English weight is to divide the sum by 4, which gives the equivalent in drachms very nearly thus:—

Grammes.		Drachms.	Oz.	Drachm.	Grains.
100 ÷ 4	=	25 =	3 .	1 +	43

[*See following pages.*

[*See preceding and following pages.*

[*See preceding pages.*

DO YOU KNOW why the best modern anastigmat far excels even the best lenses of the old types? What is an anastigmat? This is explained with illustrations in a dainty little book, which

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LENSES of the R.R. or Symmetrical and other old types cannot give sharp definition at the margins of their plates in any way but by being stopped to *f*/16 or less.

But COOKE LENSES at *f*/6·5 will give sharp definition at any part of the plate, and from this point of view the COOKE LENS, Series III., may fairly be regarded as more than six times as rapid as any R.R. Lens.

Besides combining, in a high degree, rapidity and defining power, COOKE LENSES are truly Rectilinear and free from all traces of flare and ghost and other common defects of Lenses.

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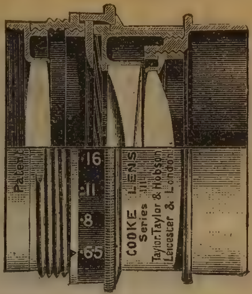
[*See following page.*

Sectional View of a

COOKE LENS

showing its three simple glasses and the screw adjustments by which final perfection is obtained.



Series III. Full aperture f/6·5.

Approx. equivalent focus in inches.	With large apertures to cover plates.	When stopped down, to cover plates up to	Diameter of Standard Screw.	Diameter of Standard Hood.	PRICES.	
					Lens with improved Iris Diaphragms.	Patent Flanges extra, each.
5	4¼ × 3¼	5 × 4	1·5 in.	1·45 in.	£4 0	2/-
6	5 × 4	6½ × 4¾	1·5 in.	1·6 in.	4 10	2/-
7·5	6½ × 4¾	10 × 8	1·75 in.	1·9 in.	5 10	2/-

Series V. Full aperture f/8.

Similar in form to *Series* III.

Approx. equivalent focus in inches.	With large apertures to cover plates.	When stopped down, to cover plates up to	Diameter of Standard Screw.	Diameter of Standard Hood.	PRICES.	
					Lens with improved Iris Diaphragms.	Patent Flanges extra, each.
9	8 × 5	12 × 10	1·75 in.	1·9 in.	£7 10	2/-
11	8½ × 6½	15 × 12	2 in.	2·1 in.	8 10	2/-
13	10 × 8	17 × 15	2·25 in.	2·5 in.	10 0	2/3
16	12 × 10	18 × 16	3 in.	2·8 in.	15 0	3/-
18	15 × 12	24 × 20	3 in.	3·3 in.	18 10	3/-

TAYLOR, TAYLOR, & HOBSON,

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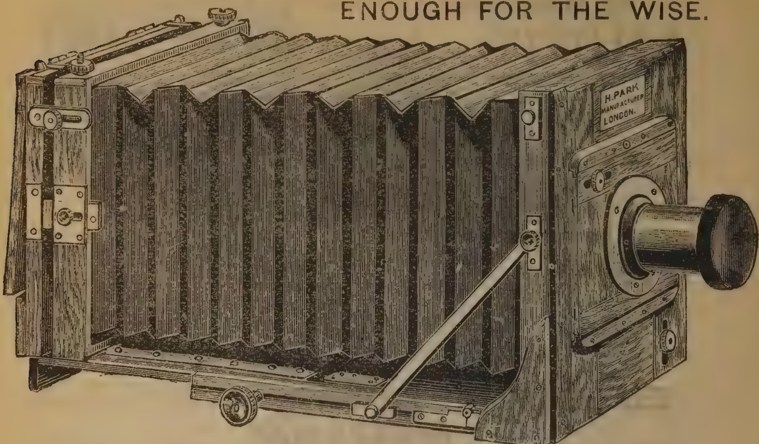
[*See preceding page.*

ENOUGH FOR THE WISE.



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PRICE, WITH ONE DOUBLE SLIDE.

For Pls. Inches.	Length of Focus.	Square.
6½×4¾ ..	16 in. ..	£6 0 0
7¼×4½ ..	18 ,, ..	6 6 0
7½×5 ..	20 ,, ..	6 10 0
8½×6½ ..	22 ,, ..	7 13 0

For Pls. Inches.	Horizontal & Vertical.	Square.
10×8 ..	26 in. ..	£9 0 0
12×10 ..	32 ,, ..	10 2 0
15×12 ..	36 ,, ..	12 16 0
18×16 ..	42 ,, ..	16 10 0

For Pls. Inches.	Length of Focus.	Square.
20×16 ..	46 in. ..	£17 15 0
22×18 ..	50 ,, ..	18 5 0
24×20 ..	54 ,, ..	21 0 0

Plates.	Extra Double Slides.	Brass Binding.
6½×4¾	£0 16 0	£1 2 0
7½×5	0 17 0	1 3 0
8½×6½	1 1 0	1 5 0
10×8	£1 5 0	1 10 0
12×10	1 12 6	1 15 0
15×12	2 5 0	2 5 0

☞ TESTIMONIALS. ☜

'Henry Park, Esq. ☞ UNSOLICITED. 'Adelaide, S.A., 20/7/96.

'Dear Sir,—The Cameras, &c., have just arrived, and I am writing to thank you for the excellent manner in which you carried out my orders, and to tell you how delighted I am with the apparatus. The Cameras are beautifully made, both in design and workmanship, and are undoubtedly the best I have ever had, and all that I could desire. I will have much pleasure in showing them to the Members at the next meeting of the Society, and in recommending your work at every opportunity. Yours truly, J. G.'

We hold many others from Customers at Home and Abroad.

All made of specially seasoned Wood, selected with greatest care, & are made on the Premises.

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HENRY PARK, Practical Photographic Apparatus Manufacturer,
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CHILD STUDY.

MORGAN & KIDD'S BROMIDE PAPER.

Neg: by Byrne & C° *Richmond*

SUMMARY.

The year just terminating has not been unfruitful in photographic progress, and, on the whole, it has perhaps been not an altogether unsatisfactory one to professional photographers, manufacturers, dealers, and the like generally. There is reason to suppose that the industrial applications of photography have an expansive tendency, and that the number of those who take it up as a leisure occupation is not diminishing. We may therefore assume that in its commercial aspects the immediate future of photography is assured of prosperity. But of necessity that prosperity is hinged upon practical and scientific progress, and to what has been achieved in those directions during the year it is mainly the function of this brief summary to draw attention.

Radiography.

In January last Professor Röntgen, of Wurzburg, published a paper detailing the results of some experiments with electrically excited radiant matter tubes in a state of high vacuum, and the world was astonished to learn that solid substances were penetrable by the rays proceeding from those tubes, and that 'photographs' could be taken through 'opaque' bodies. Röntgen's experiments were immediately repeated and verified, with what results is now generally known. The phenomena of radiography are perhaps of more direct interest to physicists and medical men than to photographers: the physicists have still to decide precisely what the rays are, and the medical men find them of extreme service in the diagnosis of disease. Since the publication of Röntgen's paper (which will be found printed in the 'Epitome of Progress' at the end of the volume), some minor improvements have been effected in the tubes employed, so enabling sharper results and shorter exposures to be achieved; but, with that exception, as is remarked by a writer elsewhere, radiography is virtually where Röntgen left it in his paper, which also contains the suggestion of the fluorescent screen, that is found so useful for visual shadowgraphy.

Acetylene.

As we predicted last year would be the case, this new illuminant is gradually forcing its way into public favour. Some photographers

have already adopted it for projection and portrait work with satisfactory results. The manner of utilising the gas is dealt with in some extracts from the writings of trustworthy authorities that are given in the 'Epitome of Progress,' and to which the reader is referred.

So far, experience has shown that, used as generated, and in the apparatus commercially designed and sold for the purpose, there is no attendant danger in the employment of acetylene. As much, however, cannot be said for the gas when it is compressed in cylinders, and it is with regret we have read of two fatal accidents occurring through its use. Detailed particulars of the causes of those accidents are, unfortunately, not available for investigation. One result of them, however, has been to induce the insurance companies to look upon the acetylene light as dangerous, so that some offices decline to grant policies on premises where the light is used. This attitude may have serious effects on the use of acetylene for photographic purposes, and it is strongly to be hoped that the companies may have every reason to modify their conditions.

Animated Photography.

What is called, for want of a better term, animated photography, leapt into public notice early in the year, and as a source of entertainment has been noteworthy. The rapid taking of successive views of moving objects on continuous sensitive bands, and the projection, by similar means, of the positives on to the lantern screen is not by any means new in principle, but it remained for Mr. Acres, Messrs. Lumière, and others, to give practical effect to the system. The apparatus originally employed by these gentlemen is briefly described in the 'Epitome of Progress.' Mechanical and other obstacles have been in the way of a general extension of animated photography during the past season; but with the imminence of special cameras, lanterns, and films, effective in use and reasonable in price, it is safe to predict that this interesting branch of work will receive a great fillip during the coming year.

General Photography.

Very little change has to be recorded with regard to photographic processes during the past year. Colour photography has made practically no advance, although the application of the three-colour process to ordinary camera work is likely to be soon heard of. As regards surface printing processes, photographers appear to have not changed their predilections. The newer lenses, however, appear to be coming into greater use. Film photography has engaged some amount of attention, and it is probable that efforts will be followed up to provide a

substitute for glass other than celluloid to comply with the requirements of those photographers with whom absence of weight is a desideratum.

The Photographic Copyright Union.

This useful Society has pursued its mission of defending photographic copyright, and there can be no doubt that, on the whole, its work has reacted to the benefit of the general body of photographers. It is due to the Photographic Copyright Union that the illustrated press has at last realised that copyright photographs may not with impunity be pirated in the wholesale manner that was once notorious; that a minimum fee for reproduction has been agreed upon by a large number of photographers; and that the rights of photographers in their copyright photographs are as real and as worth defending as the rights of authors, painters, and others.

We have supported the Union throughout its career, and our opinion that all photographers should join it is as firm as heretofore. In the Section of the Almanac devoted to Photographic Societies will be found (1) The Copyright Act; and (2) The Forms, Rules, &c., of the Copyright Union. Professional photographers may possibly find this information of service to them.

Photographic Societies, &c.

A reference to the 'Directory of Photographic Societies' will show that the number of these bodies is still on the increase.—The Convention meeting at Leeds was very successful, and some of the funds in hand are, it is satisfactory to note, being applied to the assistance of original research work in photography. The meeting in 1897 is to be held at Great Yarmouth.—The Royal Photographic Society continues to add to its members, and there is no doubt that its Charter and Fellowship scheme have resulted materially to its advantage, and in future years may have important influence in the photographic world.

Obituary of the Year.

Since the publication of the last Almanac death has dealt less heavily with the photographic world than in some preceding years; but on November 8, last year, and while the Almanac, of which he had so long been editor, was passing through the press, our honoured predecessor, Mr. J. Traill Taylor, passed away in America. A full biography was given of the deceased gentleman in The British Journal of Photography of November 15, 1895, and many of his friends have since subscribed to a fund for the purpose of providing a memorial of him, which is to take the form of an annual lecture on a photographic subject.

Other losses during the year were Mr. Thomas Samuels (March 1), known for his inventions applied to hand cameras; Rev. H. J. Palmer (March), a once well-known worker in the North of England, and formerly President of the Liverpool Amateur Photographic Association; Mr. Wm. England (August 11), whose photographic work began in the Daguerreotype days, and who was subsequently noted for his fine Swiss photographs, early instantaneous views, &c.; Dr. P. E. Liesegang; Colonel Lloyd-Verney (a once well-known member of the Photographic Club); Mr. H. Jackson (long in business at Fishguard as a photographer); Mr. Thomas Keig (a professional photographer, who died while Mayor of Douglas, Isle of Man); Mr. A. J. Melhuish; Mr. Alexander Johnston, of Wick (June 21), &c.

MODERN PHOTOGRAPHIC LENSES.

By The Editor.

In the following chapters I propose to describe most of the photographic lenses that have been devised and introduced during the last ten years. Hitherto no attempt has been made to give the information in a collected form, and, in resolving to fill, however incompletely, the gap that has so far existed, I am led to do so by the hope that the few notes here presented will be of service to that very numerous body, the users of lenses, who, in contradistinction to mathematical and manufacturing opticians, wish merely to become acquainted with the salient characteristics of the objectives at their disposal, and are therefore content to leave the optical and physical data that are involved in lens construction to the comparatively few who are more immediately interested therein.

I.—Introductory.

For a period of about twenty years, that is, from the introduction in 1866 of the Steinheil Aplanat, which is generally admitted to have been the model upon which most lenses of the symmetrical or rectilinear type were afterwards made, photographic-lens makers made very few entirely new additions to the optical resources of the photographer.* I use the term 'new' in the sense of its applicability to principles of construction. The reason for this is, of course, clear. The glass makers at home and abroad only supplied opticians with material the refractive and dispersive properties of which had been already utilised to the fullest advantage in existing objectives, so that, if even the mathematicians had calculated out formulæ for improved lenses and the opticians were anxious to work to them, the inability of the glass makers to supply glasses having the properties demanded by theory raised an obstacle that would have forbidden the translation of theory into practice.

Looked at only as scientific instruments and by the light of the later knowledge of the subject that has been gained, it will probably be admitted that, prior to very recent years, the lenses in general use fell far short of perfection, whatever their photographic performances may have been. An exception may be allowed in the case of the portrait lens, which, notwithstanding its smallness of covering power and its possession of spherical aberration and astigmatism, could not, probably, be improved on for its own immediate purpose. But lenses of the rectilinear and wide-angle forms, with which the practical photographer, next to the portrait lens, most frequently works, suffered more or less from various aberrations or defects, which, it is true, could be partly suppressed by the use of small diaphragms, and therefore at the expense of rapidity of

* See note, p. 640.

working, so that, when opportunity offered, it was inevitable that opticians would endeavour, while increasing if necessary their angular apertures or rapidity of working, to correct the aberrations of lenses so as not to necessitate the use of the diaphragm to the same extent as heretofore.

The problem that awaited them, in fact, was to provide objectives having greater covering power and rapidity of working, and to correct them so as to allow of the field being freed of curvature, and astigmatism eliminated from the image. Those conditions were hitherto not simultaneously realisable, mainly because it was impossible properly to achromatise with the flint and crown glasses available, or even with two flints, on account of the disproportion in dispersion of most of the heavy flints compared with that of crown or light flints. The key to the problem, therefore, was in the hands of the glass makers, and only those who have made a close study of the optical side of this subject can realise how great—and it must be said, how hopeless—at one time the problem seemed of solution.

II.—The Jena Glasses.

The establishment of Messrs. Schott's glass works at Jena made it possible not only to improve the properties of lenses already existing, but also paved the way to the introduction of new objectives, to the number of which additions are even now being made. It is customary for photographers and others still to speak of the "new Jena glass," which inexactly conveys that the Messrs. Schott catalogue some hundred different kinds of glass, different, that is, in respect of the substances used in their manufacture, and in the refractive and dispersive properties of the resulting compounds. These glasses possess, among other features, a greater variety of refractive and dispersive powers than was formerly obtainable, and the opticians can now, as a rule, obtain any of them that are catalogued uniform as regards the accuracy of the indices. Moreover, if a glass differing in refraction at one or other part of the spectrum is required, it can also be had; indeed, there are glasses for almost every special purpose likely to arise in the achromatisation and correction of photographic lenses.

The new glass, which was, I believe, originally produced for the purposes of eliminating the secondary spectrum from microscope object-glasses, unites three colours of the spectrum to a common focus, whereas with the old flint and crown, it was only possible to make the spectra coincident as regards the yellow and violet colours. The indices of refraction and dispersion are supplied with each pot of glass, consequently this system of precise specification saves the optician much trouble in ascertaining the indices of the glass for himself.

Now, the practical outcome of all this is that, as these glasses allow of such combinations being made as were before impossible on account,

as already pointed out, of the disproportionate dispersions of the flints and crowns then in use, lenses can now be produced having flatter fields, and more freedom from astigmatism, than were heretofore obtainable. It is, I believe, the case that other firms, besides Messrs. Schott, now make glasses of the nature of that to which reference is here made, but the initiative rests with the Jena firm, and the credit therefore should be assigned to them in conjunction with the Prussian Government and Professor Abbé, for placing new and valuable powers in the hands of object-glass makers.

III.—Miethe's Anastigmat Lens.

Dr. Miethe was probably one of the first to take advantage of the new glasses, for in 1888 Hartnack, of Potsdam, was said to have constructed a lens, after formulæ supplied by Dr. Miethe, which was almost free from astigmatism. The lens gave a flat field with a large aperture, and the sharpness was stated to have been exceptionally fine. It covered a circle of 65° with its largest aperture *f*-7, the sharpness being maintained throughout, and, by an arrangement of the mounting, the components could be brought nearer together, and, when quite close and the aperture reduced to *f*-40, the circle of sharp delineation extended to 90°.

It does not appear that any drawings or a full description of the lens were published in this country; hence it is only possible to give a vague idea of its construction. It was, however, said that, externally, each of the two achromatic lenses forming the combination, which was symmetrical, consisted of a thin cemented meniscus, in which, contrary to the practice that had so far prevailed, the convex element of the compound had a much higher index of refraction than the concave by which it was corrected.

We are not, however, called upon to devote more attention to this lens, which does not appear to have been afterwards heard of, and was probably only experimentally constructed. Still it is of interest to note that Dr. Miethe was also understood to have produced another lens working at *f*-6·5, which embraced a field of 50° therewith; but in those days (1887–8) it was easier to specify a glass than to obtain or supply it, so we may surmise that Miethe, like other opticians subsequently, was also baulked in his endeavours, from lack of the requisite material.

I remark that the term 'anastigmat' was, for the first time, employed with respect to a photographic lens by Dr. Miethe when writing of the above-named abortive objectives.

IV.—The Concentric Lens.

Although not introduced to the photographic public until the early part of 1892, the concentric lens, the invention of Messrs. Schroeder & Stuart, was calculated out and patented in 1888, certain difficulties in

obtaining the requisite glass being, I believe, responsible for the delay in its commercial production.

The concentric lens (fig. 1) is so named from the fact that the radii of both the back and the front surfaces are struck from a common centre—that is, those radii if completed would become circles.

The lens, in one respect, differs materially from previous lens

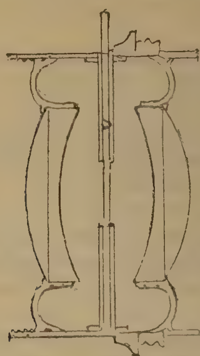


Fig. 1.

constructions in that (reversing what hitherto was the case in symmetrical doublet lenses) the radius of the outer or convex surface is longer than that of the inner or concave curve.

The concentric is symmetrical in construction. Both front and back elements of the lenses are composed of (1) a plano-convex lens of high refractive (1·59 to 1·61) and low dispersive power, cemented to a plano-concave, the glass of which is of *lower* refractive power than the other, but of the same or higher dispersive power.

The peculiar construction of the lens is favourable to great covering power and flatness of field and practical experience has borne out that it is in these respects that the concentric excels. At full aperture, that is *f*-20, an 8-inch covers a 10 × 8 plate sharply to the extreme edges; and accurate tests and measurements have demonstrated that the lens is quite free from astigmatism.

Nevertheless, the construction of the lens which gives to it certain characteristics of the old-fashioned wide-angle lens necessitated the use of a comparatively small stop, which has probably robbed the concentric of that favour to which its other qualities entitle it. I may, however, mention that I have seen many negatives taken with an aperture of *f*-11,

which leave so little to be desired in the way of defining power as to suggest that the possibilities of the lens have not been wholly realised.

Still, at a larger aperture it can be used for producing very 'soft' results by the introduction of spherical aberration over an anastigmatic field, thus differing from older lens systems, which gave diffusion by means of increased spherical aberration introduced into a field already astigmatic.

V.—The Zeiss Lenses.

The above is the generic term applied to a series of lenses, due to the calculations of Dr. Rudolph, which were introduced by Messrs. Zeiss about five years ago. The series numbers about six lenses, ranging in ratio of working aperture from *f*-6·3 to *f*-18.

To enter into an exhaustive explanation of the underlying details governing the construction of these lenses is not necessary; but, I may briefly state, that the Rudolph principle is the combination in one objective of two distinct systems of lenses, each composed of single lenses cemented together, the positive element of one system having a higher, the positive element of the other a lower, refractive index than the respective elements cemented thereto, each system being, in itself, *approximately* achromatic. The two combinations possess, in fact,

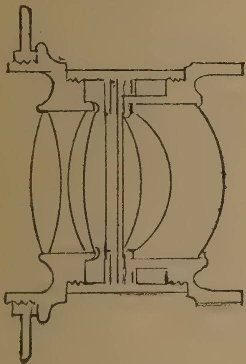


Fig. 2.

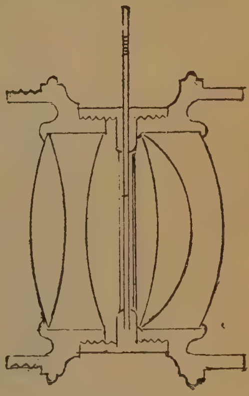


Fig. 3.

opposite degrees of refractiveness in the flints and crowns employed, which, according to Dr. Rudolph, embodies the principle by which it became possible to eliminate astigmatism from a system of lenses

corrected spherically and chromatically for a large aperture. This, of course, means that not only is astigmatism not present, but the field of the lens is flattened—a condition of things not previously realised, and especially with a large aperture—flatness of field having hitherto been obtainable only at the expense of astigmatism.

The illustrations (figs. 2 and 3) convey an idea of the construction of the lenses, which are non-symmetrical. Their excellent properties are perhaps too well known to need reference here, and the range in ratio of working aperture from *f*-6·3 to *f*-18 indicates, with sufficient distinctness, the fact that the series embraces lenses specially constructed for rapid, copying, wide-angle, or 'universal' work.

VI.—The Goerz Double Anastigmat.

The Goerz lens, brought out by Messrs. Goerz and Von Hoegh in 1893, apparently resembles in principles of construction the Zeiss series, but it nevertheless differs from them. The Goerz lens (fig. 4) is a symmetrical doublet, the two component systems of which are each corrected for spherical, chromatic, and astigmatic errors. This end is attained in two ways, viz., (1) by enclosing a negative lens between two positive lenses, one of which has a higher, and the other a lower refractive index than the enclosed negative, astigmatism being corrected by the highly refracting and spherical aberration by the lower refracting positive, and

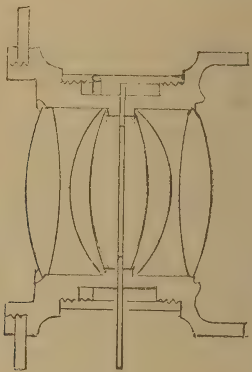


Fig. 4.

(2) by enclosing a positive lens between two negative lenses, of which one has a higher and the other a lower refractive index than that of the enclosed lens.

At the full aperture of 7·7 an angle of 70° is included, the field being without curvature and astigmatism being claimed to be corrected throughout the whole plane of the image. By the use of smaller diaphragms, the lens may with signal advantage be employed for larger-size plates. The Goerz lens deserves to be specially noted for the fact that it was probably the first lens issued which, with symmetry of construction, fulfilled the aspirations of opticians and photographers—noted in a previous chapter—for flatness of field, freedom from astigmatism, and great covering power combined with large aperture.

Yet it may here be pointed out that the credit for being the first to take advantage of triple cemented combinations, for effecting the correction of astigmatism and spherical aberration, appears to lie between Dr. Rudolph and Herr Von Hoegh, a matter that formed the subject of correspondence in the pages of THE BRITISH JOURNAL OF PHOTOGRAPHY in 1893. On the other hand, to Dr. Hugo Schroeder has been assigned the reputation of being the first mathematical optician to perceive the ultimate possibilities of the new glasses made at Jena.

VII.—THE TURNER-REICH LENS.

Two American opticians, Messrs. Turner & Reich, utilise no less than ten glasses in the construction of a symmetrical doublet, that they

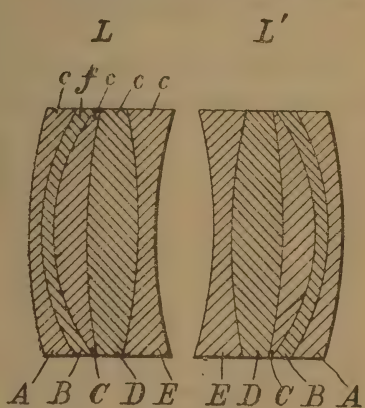


FIG. 5.

brought out about eighteen months ago, five lenses being combined in each compound so as to produce a lens claimed to be *practically* free from

chromatic, spherical, and astigmatic aberrations. The lens is, I believe, the production of the American house of Gundlach, but neither from the photographic periodicals of that country, nor from those of this, have I been able to glean information with regard to its performances or properties when used on a camera.

Messrs. Turner & Reich supply the following particulars of construction, which, they say, admits of much latitude in the details of the various lenses and also in their relative arrangement:

The quintuple lens thus formed is capable of being used singly for photographic work, or two such lenses may be combined to form a double objective, as indicated at L,L [1], (fig. 5).

The separate lenses are described in the following table:—

Lens.	Thickness.	Radii of Curvature.	Kind of Glass.	Refractive Index.
A	2·30 mm.	64·34 & 34·98 mm.	Crown	1·52
B	1·40	34·98 & 29·79	Flint	1·62
C	5·42	29·79 & 89·79	Crown	1 52
D	8·80	89·79 & 105·60	Crown	1·60
E	1·76	105·60 & 63·36	Crown	1·52

The diameter is 38·50 mm., distance from outside to outside of the double objective 49·20, and equivalent focus 279·40. C and D are the collecting lenses, and A B E the dispersing lenses.

VIII.—The Steinheil Orthostigmat.

I have no information concerning the lens figured in the annexed

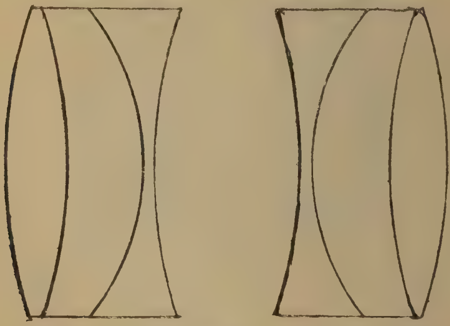


Fig. 6.

drawing (fig. 6) except that given by its inventor, Herr R. Steinheil, as it

does not appear to have been sold in this country, although it forms the subject of a patent. It embodies the principle, already enunciated, of constructing a lens so that each combination shall in itself be free from chromatic, spherical, and astigmatic errors. The lens here shown consists of symmetrical halves. The middle lens is positive, and is enclosed by a double convex lens and by a double concave, each of the two latter possessing stronger refractive power than the enclosed positive lens. Such an objective, constructed in accordance with data furnished by Herr Steinheil, is said by him to work at *f*-6.

IX.—Voigtlander's Lens.

The special characteristic of this lens is that it is composed of three cemented menisci, two positive and one negative, one positive being between the other positive and the negative, both the last-named menisci having a greater refractive power than the intermediate or enclosed meniscus.

By replacing, says the inventor, the one system of lenses by another, consisting of a double convex lens, a double concave lens and an intermediate positive meniscus, which latter has less refractive power than both

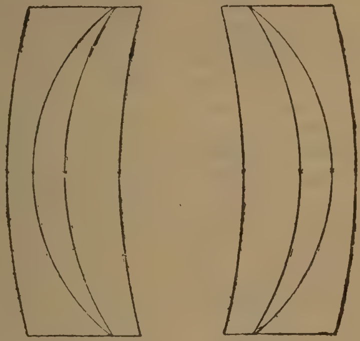


Fig. 7.

the outer lenses, the advantage is obtained, that this doublet unites in itself the advantages of each of the two unequal systems. The system in which both the outer lenses are respectively double convex and double concave allows a much more perfect correction of the astigmatism, whereas the other system, in which the outer lenses are menisci, does not allow this perfect suppression of astigmatism, but allows, as above mentioned, a much more perfect correction of spherical aberration.

Fig. 7 is a lens which is composed of two symmetrical systems.
Fig. 8 is composed of two unequal systems of lenses.

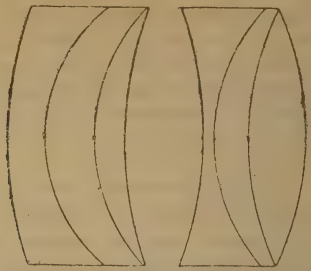


Fig. 8.

In fig. 7, the intermediate lens is positive meniscus, the outer one negative meniscus, and the other outer positive meniscus. The outer menisci have higher refractive power than the middle meniscus.

In fig. 8, the left system of lenses consists of three menisci, whereas the anterior system is composed of a double convex lens, a double concave lens, and an ntermediate positive meniscus which has less refractive power than the outer lenses.

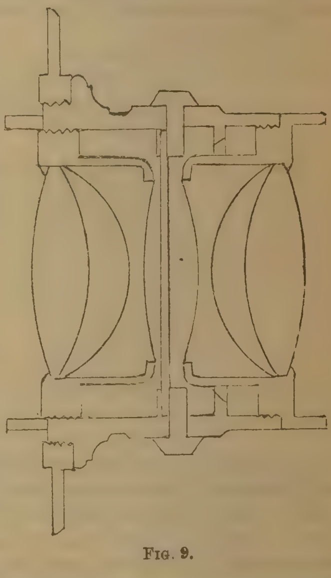


Fig. 9.

THE COLLINEAR LENS.

A comparison of the Collinear lens, depicted below with fig. 8 (right-hand side) above, shows that the curves are similar, if not identical, and it may therefore be conjectured that the lenses are virtually the same. No particulars of the Collinear have, so far as I know, been published; but it will be seen that it is a symmetrical doublet. Each element is formed of three cemented lenses the outer glass being of double convex, the second a deep meniscus the third a crossed concave.

The full aperture of the lens is *f*-6·3, and it has been found to possess great covering power, with no traces of astigmatism. The glass is singularly free of colour, and at its full aperture a 12-inch lens covers a whole-plate, at *f*-18 a 12+10 plate.

Quite recently, by an alteration of the curves and density of the centre lens of each combination of the Collinear, Voigtländer claims to be able to impart to the lens the property of working at an aperture of 4·5.

Practical experiments, he says, and with the finest precision in the performance of the optical surfaces assisted the mathematical researches,

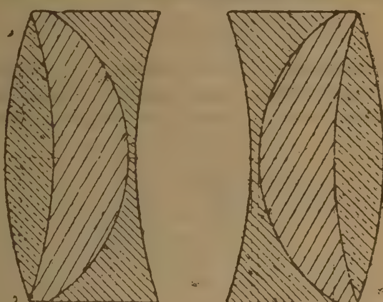


Fig. 10.

so that he finally succeeded in designing and constructing a symmetrical anastigmatic collinear of the relative aperture 1 : 4·5. Only a slight difference of the optical properties of the middle lens made this success possible, whereas any greater alterations led to impossible curvatures and impossible forms of lenses. This new construction is therefore a most sensitive one, because it is not possible to neglect the least differences in the optical properties, the curvatures, and the thicknesses of the lenses.

The whole point of the modification consists in making the centre or positive meniscus lens of lower refractive power than the biconvex and biconcave glasses that enclose it.

X.—The Platystigmat.

The introduction of the Platystigmat is due to Mr. W. Wray ; but no particulars of its construction have yet been made public. I am, however, able to indicate, in general terms, the nature of its photographic qualities.

The distinctive name chosen for the lens, is, I believe, intended to signalise its possession of a flat field associated with the absence of astig-

matism. The lens may be described as a symmetrical doublet, each combination consisting of a cemented triple, in the construction of which certain of the Jena glasses have been availed of.

The Platystigmat of five inches focus gives a flat field over a very wide angle, ninety degrees approximately, and, although at full aperture only intended to cover quarter-plate, it perfectly well covers a size larger plate without being stopped down. At *f*-16 it covers a half-plate, and at *f*-32 a whole-plate.

In the way of flatness of field the lens has been found all that can be desired, and, employed with the apertures and for the sizes enumerated above, is remarkably free from astigmatism.

XI.—The Cooke Lens.

The Cooke lens, brought out two years ago by Mr. Dennis Taylor, differs from most modern lenses in being of triplet form. As will be seen, the front lens, which is double convex, is mounted in close proximity to

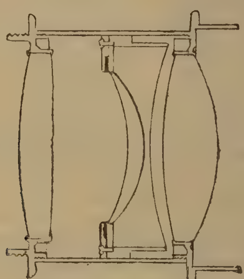


Fig. 11.

a biconcave lens of compound formation, the separation space between the two being but small. Each of these two—the separated front and the central—are said to nearly balance each other in visual power, so that, when looking through the pair, the net result is nearly akin to looking through plain glass with a tendency to diminishing. The back lens, a double convex, has its aberrations corrected and its focus slightly lengthened by those in front. Its diameter exceeds that of the others. The glass is free from colour, and no air bubbles are to be seen in it.

The following is the inventor's description of the principles upon which the lens is constructed :—

The two outside lenses are simple positive lenses, while the central negative lens, called the 'corrector,' may be either simple or compound, preferably the former.

The two positive lenses are made of glass of a comparatively low dispersive power, in fact the lower the dispersive power the better for the final result, while the refractive index is as high as possible. The 'corrector' lens is made of a flint glass of such a dispersive power as to enable it to correct the colour aberrations of the two positive lenses consistently with the other conditions being attained, while its refractive index has as low a value as possible. Although the form of the whole lens is very simple, yet the nature of the corrections involved in the lens is very complex and interlocked together; for the 'corrector' lens has to perform the following functions simultaneously.

1. To correct the colour aberrations of the two positive lenses and thus render the whole combination achromatic in the sense required by the actual uses to which the whole lens is put, whether for photographic purposes, celestial or terrestrial, or for lantern projection.

2. To correct the spherical aberration of the two positive lenses, and render the whole combination aplanatic.

3. To correct the greater part of the curvature of image of the two positive lenses, and thus, in conjunction with a small residue of diaphragm corrections, render the final image perfectly flat, while the astigmatism, generally incidental to the oblique pencils in the case of ordinary lenses, is simultaneously eliminated.

The lens does not include such a wide angle of view as other recently introduced constructions, but it is generally allowed that in defining power, freedom from astigmatism, and flatness of field, it is of great excellence. It works at f-6·5, a 5-inch at that aperture covering a quarter plate; and it is, therefore, well adapted for hand camera work.

XII.—The Dallmeyer-Bergheim Lens.

Visitors to the Royal Photographic Society's Exhibition of 1895 may recall some portrait photographs by Mr. Bergheim, in which just so much

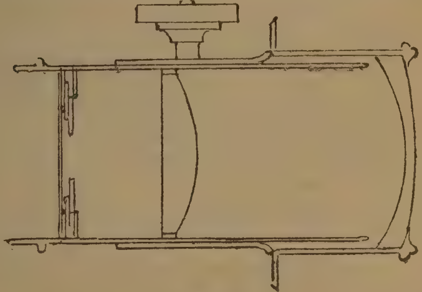


Fig. 12.

unsharpness had been introduced as, while stopping short of actual fuzziness, yet did not entirely offend the photographic eye, and complied with the requirements of artistic rendering. I have subsequently seen similar results, which were probably produced with the Dallmeyer-Bergheim lens. This instrument is composed of a single front lens of *positive* focus in combination with a single back lens of *negative* focus, the distances between which are variable, thus arriving at a considerable latitude of focal length. The spherical and chromatic aberration purposely given by the single uncorrected lenses results in a certain amount of diffusion of focus, which produces the kind of softness and delicacy aimed at by Mr. Bergheim and other workers. The lens is recommended for large heads and life-size studies.

The lens differs from any hitherto introduced for portraiture, in that it is throughout longer in focus. It is free from distortion, and covers the plate with uniform definition from centre to edge. Its largest aperture is f-9, and therefore it is somewhat slower than objectives of the portrait class.

XIII.—The Stigmatic Lens.

Mr. Hugh L. Aldis is the inventor of this lens, which is worthy of being regarded as a distinct departure in lens construction by reason of the fact that, as a portrait lens, working at the large aperture of f-4, it is claimed to possess properties not hitherto found in objectives of

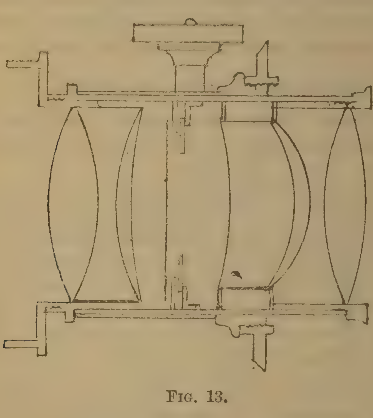


Fig. 13.

that character. It is said to be free from spherical aberration, defining sharply over the whole of the field, which is flat, while it includes a very large angle of view, 60° at full aperture.

Astigmatism is said to be almost entirely eliminated. Spherical aberration, or that property which photographers term diffusion of focus, may be introduced by the well-known method of unscrewing the back cell and separating the posterior from the middle components.

The stigmatic lens is 'made up of two compound lenses, the front one being a deep strongly converging meniscus lens with strong positive spherical aberration, but being approximately correct for chromatic aberration, whilst the rear one is a diverging system with strong negative spherical aberration to correct the positive aberration of the front lens, and also approximately correct for chromatic aberration, the whole forming a converging system correct for spherical and chromatic aberrations and free from distortion.

'The front lens is preferably made of two lenses cemented together as follows:—The first, a double convex lens of crown glass of high refractive index, whilst the other is a double concave lens of flint glass of about the same refractive index as the crown glass. In some cases it is necessary to cement behind these a meniscus crown glass also, of about the same refractive index as the other two.

'The rear lens consists of two lenses separated by a small air space; the front lens is a thick, nearly plano-convex of crown glass of high refractive index, and the rear lens a concavo-convex lens of flint glass of low refractive index.'

Mr. Aldis points out that the novelty of construction lies in the fact that the flint lenses are all of lower indices of refraction than the crowns, and that it is by these means that the correction for flatness of field, while retaining a large aperture, has been achieved.

XIV.—The Convertible Anastigmat (or Satz Lens).

The convertible anastigmat is the name given in England to a lens, or, more properly speaking, a lens system, the introduction of which is due to Dr. Rudolph. In issuing it to the public, the principle of non-symmetricality, or rather of decided inequality of foci, between the back and front combinations has been utilised; and thus, in the one doublet lens, a series of three convenient foci is available.

Each lens is a quadruplet, consisting of 'two couples of lenses, each of which couples consists of a collecting and dispersing lens, the dispersing lens of one couple having a higher refractive power, and the dispersing lens of the other couple having a lower refractive power, than the collecting lens coupled therewith.' Thus in the doublet there are eight lenses. Dr. Rudolph summarises the principal characteristics of the system as follows:—

'As to the double objective, one or both components of which are quadruple lenses of the described kind, both separate lens systems may

be of the same or of different focal lengths, and the focal length of both or only of one may be positive. Moreover, either lens system may be for itself completely corrected so as to be occasionally employed as a single objective, or both lens systems may be constructed with aberrations of

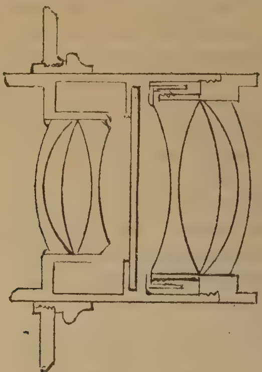


Fig. 14.

about the same amount, but in contrary sense, so that the aberrations of either component compensate one another. If only one component of the double objective consists of the above-described quadruple lens, the other component may be of any construction—it may consist of only one single lens, or of any number of parts cemented together.'

A valuable feature of this system is that the lenses are made in interchangeable series, admitting of the photographer readily obtaining any series of foci, the advantage of which will be apparent, and of which it is possible for me to speak from practical experience. To the convenience of this system the now universally desiderated properties of freedom from aberrations and great covering power are, of course, conjoined.

The entire lens may be made symmetrical, but, as already remarked, dis-symmetricality is its strong feature. Practically, however, the most important characteristic of the system is that it gives a series of single objectives of high quality which work *at the full opening of the lenses*, a condition not heretofore realised. Their intensity. *f*-12·5, is equivalent to the actual opening of the lens.

XVI.—On Some Properties of Modern Lenses.

The reader who has followed me so far will have perceived that most modern lenses have been designed with the ends of attaining large

angular aperture—or rapidity of working—in combination with great covering power, flatness of field, and absence of astigmatism. A lens which embodies these properties in a reasonable degree may be considered as approaching perfection.

The ordinary camera test will tell a fairly intelligent photographer whether the rapidity and covering power of his lens be what are claimed for it, and it is not a difficult matter to arrive at the results of a comparison by the same means; but, if it be desired either to test or compare one objective with another for flatness of field and anastigmatism, the two properties which are insisted upon as characterising modern lenses, the task is scarcely so easy.

Recognising that some simple method of measuring the defects of curvature and astigmatism that *may* be present in modern lenses was desirable, Mr. W. K. Burton contributed a descriptive paper on the subject to the *Camera Club Journal* for October, 1895. I trust I may be pardoned for remarking that Burton's paper deserves to be better known, as it is full of interest in connexion with the subject of this article; it is well worth procuring and perusing. It is too long for quotation here, but the essence of it is that, by the aid of the camera, with a test object erected 400 feet away, Mr. Burton ascertained the degree of astigmatism and curvature possessed by over thirty old and new-form lenses, and, having plotted off the results, reproduces them in a series of diagrams, which also approximately show, in curves, the sum of the vices of astigmatism and curvature of each lens. Some of the lenses I have been describing above figure in the list of those tested, and I specially refer to the subject for the purpose of observing that Burton's curves bear out in a remarkable way, in several instances, what we would expect to find would be the case from the theoretical claims made.

There are many other points separate from the details of construction and general capabilities of modern lenses to which attention might be directed, but I can only briefly refer to two. Thus, theoretically, the purity and freedom from colour of modern optical glass should, undoubtedly, make lenses constructed of such glass more rapid, *cœteris paribus*, than those they are supplanting; and on those and other grounds they should also define better. The former claim, which seems plausible enough, is rarely subjected to substantiation, although it is not only easy to arrive at the truth of it, but it should be quite a pleasant task to photographers to work out. The latter claim, however, is not so easy to settle photographically.

I am aware of some experiments having been made by a friend on the absorptive properties of the new glasses in lenses with somewhat indecisive results; but the hint here given may be instrumental in setting some other photographers at work on similar or fresh lines. As to the

test for definition, it should be borne in mind that the coarseness of grain of most modern gelatine plates is against the establishment of proof by purely photographic means of the superior defining powers of modern lenses. A structureless collodion and a very finely divided silver deposit really are necessary to do justice to the defining powers of any lens, and, incidentally, I have often thought that the affectionate regard which some veteran photographers have for the assumed wonderful defining powers of their old lenses arises from the fact that the modern gelatine plate, perhaps, does not translate fine detail so perfectly as a collodionised film.

But it is easy to conceive that a more perfect correction of chromatic and spherical aberrations and absence of astigmatism must enhance the defining power of a lens from which such errors have been wholly, if not entirely, removed, while there is another feature which may also operate to the same end: I allude to the suppression of the secondary spectrum. The Zeiss lenses are, I believe, claimed to be apochromatic, and therefore, as in the case of microscopical object-glasses, a superior quality of definition should also be imparted to the photographic objective, although I am aware that some opticians have cast doubt on the practical utility of eliminating the secondary spectrum from photographic lenses Still, it seems reasonable to suppose that the better coincidence of the spectra of the component glasses of a lens may also have a beneficial effect on its defining power, as well as other advantages.

I do not, however, think that photographers, as a body, have fully grasped the capabilities of the lenses which optical science has recently placed at their disposal, or that sufficient attention has as yet been given to a highly interesting subject, which I may not further deal with on the present occasion, but which I shall possibly take other opportunities of treating.

NOTE.—The Steinheil Antiplanat, and one or two more recent lens constructions, some of which are practically abandoned, have had to be denied reference in the foregoing chapters by reason of considerations of space, and not from any express desire to withhold recognition of them.

RADIOGRAPHY IN PRACTICE.

By G. Watmough Webster, F.C.S., F.R.P.S.

The Editor suggests that a few remarks on this topic will be useful for readers of the Almanac, and, as it will be making its appearance at a time when photographic work proper is less to the fore than in the bright days of summer, those wishing to make experiments in Röntgen work will have more leisure to devote to the needful preparations.

It would be very late in the day to give a full descriptive account of electro-sciography; hence, perhaps, the best mode of carrying out the suggestion will be to write a few discursive notes on the various parts of the apparatus required. It will by now be understood by almost every one that the Röntgen rays proceed from a Crookes' tube of one or other pattern; they are brought about by leading into the tube electricity from an intensity or a Tesla coil, produced through the medium of voltaic electricity from a battery or a dynamo.

The Source of Electricity.—Where the electric current is laid on from the main, all that is wanted is a lead of the requisite amount and voltage, with a resistance or a safety fuse to prevent straining the capacity of the coil beyond a safe point. Failing this source, an accumulator is the next best; but it should be understood that this form of battery does not, as some suppose, last for ever; after a month or two's disuse it would have lost so much power as to need recharging. These batteries are heavy and cumbersome, and, when needing recharging, have either to be taken to a storage supply or charged afresh by working an ordinary battery through them. Voltaic batteries, of one or other form, are most commonly used, and are thoroughly reliable when in working order. A Grove's, Bunsen, or bichromate is most likely to be useful, the two first being workable for several hours with little difference in the strength of the current evolved. The first-named is the most costly and the best, and the second cheaper and nearly as good. The bichromate is very useful; it gives off no offensive fumes, it is more costly to work, but has less danger attending its use, owing to the absence of very strong acids. A bichromate battery of a special pattern, enabling the zincs to be placed in action or withdrawn at will, is a valuable instrument to possess, but it requires more frequent cleaning to prevent the chromic compound destroying the metal work, and periodically needs taking to pieces to clean, as the chromic salt has a tendency to creep, and ultimately to render the battery unworkable. Of batteries, however, this or an accumulator may be chosen with advantage when occasional work only is contemplated. For several hours' continuous use, as, for example, at a lecture, nothing can excel a Groves' or Bunsen for a steady, continuous current of high voltage. A Leclanché battery, such as is found in almost every house in connexion with electric bells, should not be used, it becomes too quickly 'polarised,' and is useless for continuous work. With the mixed-acids battery (Groves', &c.), it should be remembered that the zincs are the portions that suffer waste; but this can be much reduced if they be regularly 'amalgamated.' The common plan is to rub a quantity of mercury into each face of the zinc by means of a pad moistened with acid. It may often happen that a little difficulty is experienced in obtaining mercury; an excellent substitute is the

bichloride of mercury in acid solution; it answers admirably, better than the metal itself, though, of course, at a slight expenditure of the zinc. When the zincs are kept regularly and well amalgamated, the current is stronger and more even. In all forms of what may be termed temporary batteries, the greatest care should be exercised in thoroughly cleaning out the cells after use, and in putting away the zincs, terminal screws, and clamps free from acid, dry, and with clean surfaces. They are then always ready for use at a moment's notice.

The Coils.—Most people have seen the coils, so that no description is needed. When out of use, it is desirable to keep them free from dust; when in use, the chief care is to see that the contact-breaker is in good order and adjustment. There should be a good, broad, even platinum tip to the screw—some coils have very narrow tips, which is a great mistake—and this should be periodically examined and kept smooth, or there will be a great sparking and sputtering while the current is passing, wasting the electricity and preventing the tube from acting as regularly as it should. As before mentioned, a too powerful current might irretrievably injure the coil, the most expensive part of the outfit. When batteries are used, the maker will inform the purchaser the right number of cells to use, or the amount of safe current if taken from the main. The cost of the coil is the major part of the outlay, the price varying from 6*l.* or 7*l.* for a two-inch spark up to close on 20*l.* for a six-inch. For general purposes a three-inch will be a very useful size, and give electricity of sufficiently high voltage to work a tube that would, for example, photograph through the hand in a minute or two. It would not be enough to enable satisfactory photographs through the thorax or the skull.

The Crookes' Tube.—At the present time many new forms are being tried, and gradually some approach to a kind of principle of construction is being formulated which will probably lead to a more efficient form than any yet worked being put on the market. Meanwhile, the shape devised by Mr. Jackson for his experiments before the Röntgen rays were discovered practically holds the field, and is purchasable at all the dealers'. It is advisable here to point out that, with coils giving a three-inch spark and upwards, the utmost care should be used to prevent a free end of one of the coil wires touching the glass of the tube while the current is on. It would infallifly ruin the tube by piercing an aperture of infinitely small diameter quite through the glass, and so admitting air, the tube being then useless. With six-inch spark coils this 'sparking,' as it is termed, is very liable to occur; it will start from the sides of the conducting wire itself at times, though removed some inches from the walls of the tube. Some operators endeavour to lessen this risk by covering the projections of the glass where the connecting wires are soldered in with a kind of cap of tinfoil, a plan that, by preventing a point for the discharge of electricity being formed, decidedly lessens the possibility of the sparking. It is desirable that the tubes should be well and securely fixed before starting work, as a disarrangement when operating would be a very awkward mischance. When taking a sciograph of a hand or limb, the greater the distance from tube to object the greater the sharpness of the impression (and the time of exposure also). It is often desirable to bandage the portion of the limb to be photographed to the plate by an ordinary bandage, as some subjects find it impossible to preserve sufficient

rigidity and freedom from motion. It will always be remembered that it is practically a shadow, and not a detailed object as seen by the eye in its lights and shades, that acts upon the plate. The various degrees of penetrability of different parts of the osseous framework to Röntgen radiations frequently leads to pseudo-relief on the object depicted, but this is only casual, and not a necessary effect.

LIGHTING HEADS UNDER THE SKYLIGHT.

By A. Clarke.

Most of the work done these days, especially in the lighting of faces, has too much of a sameness, not enough individuality displayed—it is that same grey, soft lighting, which for some subjects, such as children and ladies, would be quite suitable, but in the masculine gender is certainly out of place. If we wish to soar as artists, more freedom must be used in illuminating the model, our sitters must be studied more, using greater top light for some (of course, under proper control), side light for others. A little light in rear of the sitter, both top and side, often produces unseen effects that are very beautiful. The face can be greatly altered by the way the light is directed on it, and also by the position it is turned. A great deal more attention should be given to both the position of the face and direction of the light. It is here where a great deal of artistic power comes in. We have power to beautify a face or make it appear emaciated, and with that great adjunct (retouching) can improve our work. I mean retouching in moderation, and not in making enamelled balls of every sitter. Two golden rules there are to produce the finest work: namely, first, be as perfect as you can in illuminating the face coupled with great care in development; second, do very little retouching, simply because, if the first rule is attended to, then very little working up will be required. Now, just a word or so as to backgrounds. A great improvement in the majority of pictures that we find would be the use of a much darker ground, especially for aged sitters; brown paper makes a cheap and efficient ground, and can be procured at at a very trifling cost. Here is an instance where a dark ground would be most suitable: An aged man or woman walks into the atelier, dressed, like the majority of old people, in darkish clothing. How shall we proceed to secure the best effect? An artist would certainly place a dark ground behind so that the clothing would be partly lost in the ground, and in the resulting work there would be nothing to distract attention from the face. For example, we have only got to examine the finest paintings, or engravings of same, for those lessons to be seen at once; you will find then that the face is always dealt with as the principal part, and then the figure, not *vice versâ;* also place the head a trifle out of focus (I am here alluding to a good-sized cabinet head upwards) coupled with good massive shading, and good half-tone to unite the masses; your work will then take the lead, making you happier and raising your position as an artist. I will now sum up by saying, If you live in the country and cannot visit picture galleries, study good engravings from good pictures, they will give you invaluable lessons; for instance, the *Art Journal* and *Magazine of Art.*

INTENSIFICATION WITH BICHLORIDE OF MERCURY AND POTASSIC CHLORIDE.—A PERMANENT PASTE.

By W. T. F. M. Ingall.

The proportions are really immaterial, about equal does very well. It does not require the careful washing of the current formula, although I believe it should be washed. I always do, although the evenness and delicacy of the white film give one the idea that washing before developing again is doubtfully necessary. Any degree of intensity can be commanded. After washing, redevelop.

Stoppers for Bottles.—I find the best stopper is a ground neck, with a cork dipped for one-third of the bottom in melted paraffin wax.

Permanent Paste.—I have experimented and find the following in every way most satisfactory:—

Starch	1 ounce.
Gum arabic	1 ,,
Scotch glue	1 ,,
Water	½ pint.

The starch to be blended in a small quantity of the water first, then all boiled together and stirred until well blended. Pass through muslin and add a few drops of oil of cloves.

FINISHING AND STORING NEGATIVES.

By W. G. Stretton (Rangoon).

At the request of our worthy Editor for a contribution to the Almanac I send this paper; and, if it be the means of furnishing a system of 'working' to those who have just taken up the art, or of inducing others who have no system (and many such there are) to mend their ways, its purpose will have been fulfilled.

Finishing.—After fixing grind the edges of the negatives, it is well worth the little trouble. It saves cut fingers when turning them over, and negatives with ground edges are pleasant to the touch. I keep a small piece of stone with a flat surface, and a shelf in the dark room for the purpose. Hold the stone in the left hand, and, with the right, rub each edge of the negative in succession on the stone, one side at a time; it is only half a minute's work.

Varnishing.—Always varnish negatives that are worth keeping. After varnishing, paste slips of paper, $\frac{3}{16}$ of an inch wide, at the top and bottom edges of the negative, within half an inch of each end, the long way of the plate (a little sky and foreground can generally be cut off), but the ends never, on which write the date it was taken, the subjects and the number of its box, and anything else likely to be of use. These slips also serve the purpose of keeping the negatives apart when stored in their boxes, thereby preventing abrasion of the *film*, as will be seen further on. A little trouble you will say; perhaps so, but a lot of trouble saved hereafter, and a lot of negatives too.

Storing.—For a long time, I, like others I suppose, stored my negatives in the empty dry-plate boxes, until, on one or two occasions, when opening a box to get a particular negative, I was horrified to find the top negative covered with myriads of ants and their eggs; the box, in fact, was full of them, and several negatives ruined. To remedy this, I decided to have metal boxes of such dimensions that the negatives should have as little 'play' as possible. The next mail, therefore, took an order to Mr. W. Tylar, of Aston, Birmingham, to make me two dozen black japanned tin boxes, $4\frac{5}{16} \times 3\frac{5}{16} \times 1\frac{1}{16}$ *inside* measurement. The lids, or covers, to slip right over the boxes (the flat way), and to be numbered at both ends from one to twenty-four. These boxes hold one dozen negatives each, with the aforesaid slips at the edges. In due course they arrived, and they were a pleasure to look at, and are now ranged on the shelves.

When storing the negatives I place a quarter piece of cardboard at the bottom, then the negatives face to face, the aforesaid strips of paper at the edges, keeping them an appreciable distance apart. They are also light-tight, and can be used for dry plates if required. An index book is now wanted, showing the date the negative was taken, the subject and the number of its box. By this system it is an easy matter to find any particular negative out of many thousands. In fact, it is simply a matter of turning over, at the *most*, one dozen negatives. But you will say, 'How are the negatives taken out of the box?' Simply by turning them right out into the palm of the right hand; that's all. To those, therefore, who have not yet decided on a system of storing their quarter-plate negatives (and other sizes for that matter), I say, 'Go ye and do likewise.'

THE WELLINGTON STRIPPING FILM.

By E. H. Micklewood.

As the attention of amateurs may not have been sufficiently directed to this new film, or as they may have concluded that it involved a lot of extra work without any counterbalancing advantages, I thought the experience of one who has used a few dozen, and formed a high opinion of them, would be of interest in the Annual.

It would, perhaps, be best in the first place to tabulate the advantages, and *vice versâ*, before more specifically considering the working of them. The advantages are—lightness, small space occupied, absence of fragility, absence of halation, possibility of printing from either side with equal results, ease of storage, safety and lightness for transmission by post, and great latitude in exposure. About the only disadvantage I see is in the fact of more manipulations, and of a more delicate nature, being required before the finished negative is available.

Now, as to stripping, I have never yet failed, so conclude this would present no difficulty with any one reasonably careful; but I have lost several in drying on the glass by their failing to adhere until quite dry, in which case they cockle up badly, but I find this is due to not using the soaking solution fresh for each batch. Some action evidently is set up in this solution which renders it useless, or, at any rate, unreliable, after a

day or so. I would strongly advise any one trying these films to strictly adhere to the instructions, and on no account omit the alum bath.

I do not consider them suitable for the hand camera as they do not appear to be fast enough, but I again repeat they allow great latitude in the exposure, and that. combined with the great absence of halation, will enable results to be obtained which are almost impossible with glass plates.

I would specially warn the 'You-touch-the-button' sort of photographer not to trouble about them, they are not in his line; but to the amateur who does not begrudge a little extra time and trouble I can promise results which are possessed of a roundness of image and gradation which are quite exceptional on a plate.

As an old user of the Eastman stripping film, I have no hesitation in saying that the Wellington film is just as certain as to stripping, and quite free from clear spots.

The film is issued in two forms, viz., cut, or in rolls, for the roll-holder, and they differ inasmuch as the cut films have a plain gelatine film on the back, so that they keep flat in developing, &c., the roll-holder films, however, are not so coated, and curl up somewhat in developing, washing, &c.

I think I have found a decided advantage in not wetting the films with water first, but would warn any one using them for the first time to be careful not to allow the film with gelatine backs to stick to the bottom of developing dish, to avoid which it is only necessary to see that the developer thoroughly wets both sides in the start. I note the same makers have now put on the market a negative paper which does not require stripping, but trust they will continue to also issue the stripping films, as they are so useful for single transfer carbon.

A USE FOR WASTE NEGATIVES.

By G. G. Mitchell.

I have occasionally made suggestions regarding improvements in printing-room matters. Here is one I have lately been practising, which, though simple and homely to a degree and making small show of ingenuity, is, nevertheless, a really good and efficient thing. In making use of it, I have reduced considerably the contents of the inevitable waste plate box; probably some other fellow may have done it long ago, and, as likely as not, succeeding fellows may do it for a long time to come, because it is cheap, easy, and always at hand.

Take a waste plate that has had the hypo washed out of it and dried. Moisten a patch in the centre, of the size you wish to be clear glass, and remove the gelatine from it; then, with a penknife or other sharp point, scratch the remaining film in lines radiating from the centre to the edges, in such a manner as to produce gradation in the print. Quite a large variety of vignetting glasses can be made in this way, requiring but little skill, and with very little trouble. These glasses lie nicely in the splay of the printing frame at a sufficient height above the negative to secure softness.

Ordinary waste negatives make very capital semi-vignettes when

treated in this manner, and any degree of density can, of course, be given to the edges of them when perfectly white margins are required, or two or more of them can be placed together above each other. In this way an endless variety of combinations can be made.

ACTION OF THE HALOIDS UPON GELATINE.

By J. Barker.

Some fifteen years since, about 1881, three samples of washed gelatine emulsion were placed in tightly corked glass bottles, then wrapped in brown paper and stowed away in a dark cupboard, the constituents in each case being respectively :—

No. 1.		No. 2.		No. 3.	
Bromide of potassium	16 grains.	Bromide of ammonium ...	12 grains.	Bromide of ammonium ...	12 grains.
Silver nitrate ...	20 ,,	Iodide of potassium	½ grain.	Iodide of potassium	¼ grain.
Nelson's gelatine...	20 ,,	Silver nitrate ...	20 grains.	Chloride of ammonium ...	¼ ,,
Water ...	1 ounce.	Nelson's gelatine...	20 ,,	Silver nitrate ...	21 grains.
		Water ...	1 ounce.	Nelson's gelatine...	20 ,,
				Water ...	1 ounce.

Upon examination some six years after, about 1887, the emulsions were found to be in the following conditions :—

No. 1.	No. 2.	No. 3.
The salts had sunk to bottom of bottle, the top portion being fluid but thick and opaque. The gelatine seemed to have just lost its setting power, but retaining glutinosity, as the salts easily emulsified with a slight shake, and remained in suspension in the emulsion.	Retained the jelly form, and held the salts in the bulk, but the jelly was more transparent, and not so strong as when first made.	The silver salts all settled down on bottom of bottle in a solid-looking lump. The liquid was slightly yellowish, but quite transparent, and readily poured away from salts, although slightly glutinous.

The three bottles were then again placed away as before, and have

remained undisturbed until the present time, October, 1896, when, upon examination, the emulsions were found to be in the following condition:—

No. 1.	No. 2.	No. 3.
The salts had sank to bottom of bottle, the top portion being thin and fluid, with a slight opalescence. Emulsified slowly when shaken.	Most of the salts had deposited, but a portion remained suspended in the gelatine, which was of the consistency of thin jelly. Would not emulsify satisfactorily.	The salts had deposited, leaving the top portion slightly opaline. Emulsified readily, and then had the appearance of an emulsion of gum, being quite fluid, although the salts remained in suspension.

The result seeming to show that iodides tend to preserve gelatine from decomposition, but cause a deposition of the salts into a hard mass that re-emulsifies with great difficulty.

Bromides act upon gelatine slowly, and the salts are slowly deposited, but will re-emulsify with good shaking. Chlorides decompose gelatine rapidly, and deposit the bulk of the salts quickly, but re-emulsify readily.

SOME USES FOR ADHESIVE PLASTER: DRAWING PINS SUPERSEDED.

By F. H. Glew.

Use American self-adhesive rubber plaster. This can be obtained of any chemist. Cut it up into about half-inch squares. By just pressing a piece down on the extreme edge of a piece of bromide paper it can be held securely against wood or glass much more firmly than by using drawing pins, and without encroaching to such an extent on the edge of the paper; $\frac{1}{8}$ or $\frac{1}{6}$ of an inch is ample.

For fixing a celluloid film against glass for enlarging, it has no equal.

The plaster is self-adhesive on pressure, and can be pulled off and used many times over. It has many other uses in photography, such as for temporary repairs in the field. A strip put across the edges of a packet of plates prevents scrubbing; fixed on the back of a plate, it is a good anti-halation pad.

MAKING MATS FOR LANTERN SLIDES.

By C. H. Crosby (Chicago).

Without preface or apology for this communication, permit me to hazard the statement that many amateurs addicted to lantern-slide making have frequently wished that there was some quick and easy method of cutting mats. True we have the stock sizes, and, when they happen to be the size we want, they answer the purpose nicely; but, when one makes slides by reduction, it frequently happens that no ready-made mat quite meets our desire. Several plans have been suggested, attended with more or

less uncertainty, and, as an advance upon the original plans, there has been in the market, for some years, a very good mat with a printed scale, by which one may, with care, cut out any size desired. Quite recently the writer hit upon a plan, new to him at least, which is found to work to his entire satisfaction. As it requires no outlay, and may be absolutely depended upon, it is hoped that the following description may be of some benefit to the readers of the JOURNAL.

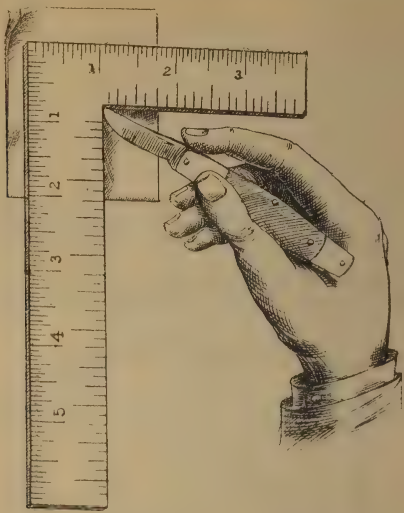
The mats are to be made out of any opaque paper preferred. The writer obtains a sufficient stock of black paper for his use from the wrappings of negative plates, and the black envelopes of photographic papers. For the standard size English slide, it is recommended to take a piece of paper four inches square. For the American standard size a piece 4 × 5 in. is recommended; the reason for this will be seen later on. Procure a machinist's steel square 6 × 4 in., or smaller or larger as preferred. The 6 × 4 in. size costs here thirty-five cents each. Fold the mat paper twice, once lengthwise, and then double over as shown in following sketch.

The paper should be folded accurately and closely. Next, having procured a proper cutting surface, than which nothing is better than a

piece of heavy glass, lay the folded paper upon it, and then upon the paper place the square, as is shown in this sketch.

It can readily be seen that the cutting is to be done against the inside edge of the square, and it will also be apparent that we must measure on the square just one half of the desired size of the opening. If we desire an opening $2\frac{1}{2}$ high × $1\frac{1}{2}$ in. wide, we place the square $1\frac{1}{4}$ in. for height, and $\frac{3}{4}$ in. for width. In the illustration, the square is placed for cutting a mat of these dimensions. Next, cut with a very sharp, thin blade close against the inside edges of the square as shown. The illustration does not show that the knife should be held as nearly perpendicular as possible and very true and close to the square, and also that the square must be kept from slipping, otherwise the result will not be satisfactory. If one can lay the glass, paper, and square upon a shelf of the proper height, and then, after the square has been placed upon the paper, clamp it there with an ordinary small iron clamp, the result will be perfectly satisfactory. Having unfolded our paper, we find that we have the opening, but the paper is too large for the plate. All that is necessary is

to adjust the opening exactly as we wish it, and then, turning the plate and paper upside down upon our cutting surface, trim off the superfluous edges. It will readily be understood that this enables us to overcome



little difficulties arising from the impression not being exactly in the centre of the plate, or possibly not being exactly perpendicular. These little inequalities can be overcome in the manner stated. It is somewhat surprising how quickly and easily mats may be cut by this process, although but one is cut at a time.

REMARKS ON LANTERN SLIDES BY THE WET-COLLODION AND OTHER PROCESSES AS REGARDS THEIR PERMANENCE.

By C. A. Ferneley.

On looking over a series of lantern slides, which I have had by me for nearly thirty years, I thought a few remarks as to their keeping properties might be interesting to lantern workers.

A small series of Westminster, St. Paul's, &c., published by the late J. Solomon, Red Lion Square, wet-collodion iron development, toned with gold. The tones were a blue slaty colour. No alteration. Temples on the Nile (Negretti & Zambra, Hatton Garden), the albumen process, the finest process then known for transparency work, both for stereoscopic and slides, the film structureless and giving warm black

tones. The negatives of these slides were taken by the late Mr. H. Rosling, sen., of Reigate, who was an ardent and enthusiastic amateur in the early days of photography and worked both wet and dry processes. These slides still retain their pristine brightness and purity.

Views of Naples, Milan, Prague, and Venice, obtained from Paris, the albumen process, by the well-known makers, Ferrier & Soulier. The tones of a rich chestnut brown, image crisp and sharp on the screen. In the cases of some of these slides I have heard of slight alteration, but those in my possession have withstood the test of time and are as perfect as when I had them, about 1867.

English scenery and architecture by a Birmingham firm. Wet collodion toned with mercury. These came out well on screen, but nearly all of them have faded, owing to instability of mercurial intensification.

Slides of Edinburgh, Holyrood, Roslin, on tannin plates of a rich brown by the late J. T. Taylor, editor of the JOURNAL. Still perfect.

Slides of Albert Memorial, Tower, Streets of London, animals at the Zoo, by Mr. F. York, the old and well-known lantern publisher, who did so much years ago to popularise photography as applied to the lantern. The slides on wet-collodion iron development and toned with bichloride platinum. Mr. York has lately informed me that, prior to 1871, his slides were toned with mercury; but, finding that agent unsuitable, he substituted platinum, which he has used ever since. These slides have not deteriorated in the least.

Slides that I exchanged with many well-known amateurs, toned with gold, are still perfect.

Slides of my own that I exhibited at Vienna, London, Falmouth, &c., which obtained several awards, wet-collodion, iron development, and toned with gold, might, at the present time, be thought too cold in tone, still retain their permanency.

Slides of my own toned with permanganate potash, no alteration.

Mr. Brooks, who has made some of the most exquisite slides, known as collodion emulsion, tones with platinum, and his slides are of a rich brown and come out charmingly on the screen.

I believe the slides by collodion emulsion are permanent.

Of slides by gelatine chloride I am not able to state anything as regards their permanence, but, what little I can learn, I do not think their keeping qualities will equal collodion, owing to a collodion slide being able to stand greater heat than gelatine.

To those who wish to obtain the most permanent and best results I should certainly advis ethem to go in for collodion slides using as toning agent either gold or platinum.

Curators of our museums and public offices, both in London and large towns, should make a selection of slides of architectural, archæological, and local subjects that are passing away, and which would be of interest and instruction to the next generation.

The question arises, and I think may be answered in the affirmative, that, if a lantern slide on collodion and toned with either gold or platinum will last without least deterioration thirty years, why should it not last double or treble the time?

I trust these few notes may be of interest to lanternists, especially those of later days, and induce them to look for permanency in their work, for slide-making is engrossing and interesting.

'HOW'S BUSINESS?'

By Redmond Barrett.

After one has made the usual inquiries as to the health and happiness of friends, the inevitable inquiry which heads these few lines is sure to crop up. I have never had the luck (good or bad) of being before a looking-glass whenever I have been asked this question—'How's business?' but I have no doubt, if 'snap-shotted' at the moment, the expression on my face would require a deal of 'softening' at the hands of the retoucher before I would order copies. I have come to this conclusion solely from the closest observation of the various expressions that flitted over the faces of my many fellow-workers when *I* propounded the question. Indeed, I feel sure I am not overstating the present position of photography as a business when I say it is *serious*. I think but very few will say that the past season, or year, has been a good one, while many will declare it has been about the worst on record. For this there must be a cause, and it is to every one's interest to discover, and, if possible, remedy it. I do not complain personally, but the reason for this is that I get a little work from many sources, but each of these sources has felt the depression in business I refer to.

It is usual, under these conditions, to attribute our misfortune to outside causes, sympathise with each other, and so find temporary comfort. The photographic bogey-in-chief used to be the poor amateur (I don't mean poor in pocket). For years we have held him responsible for the growing depression in business. He has not even now entirely shaken off that awful responsibility, but he has a partner in his trouble—the cyclist, pneumatic or otherwise. I dare not, if I would, write down, for the edification of my readers, the many not altogether complimentary expressions of opinion I have heard passed upon the members of society who find pleasure in photographing and cycling. Much less would I dare to give expression to the sentiments entertained and muttered, although not over-distinctly voiced. The dash of the editorial pen would consign them to oblivion, even if the toe of the editorial boot did not bring eternal confusion to the writer. Much as we may feel that the amateur and, later, the cyclist have interfered with the easy happiness of the photographer of former days, I cannot bring myself to the belief that they are really the responsible causes of the depression. I would feel ashamed, in my own small way, to trace any falling away in business in my own line to the competition of pupils, or amateurs, or any of the other causes which influence business. As a matter of fact, whenever I have lost business, I have been able, on reflection, to trace the cause to myself. I could not always help the circumstances that brought it about, but, all the same, I could trace the cause to my own door. What I have always made a rule of doing to myself, I occasionally have the audacity of suggesting that photographers should do likewise. If they would take the hint, I feel sure good would result. I beg, with all deference, to offer the few following suggestions for calm consideration: What do London photographers do to meet the changing fancies of their customers? How many try to make the photograph more than a mere photograph? As taste becomes more widely educated, do they try to meet the requirements? Do they exercise *all* branches of photography

calculated to realise a handsome profit, and so on? They may think they do, but I have overwhelming proof they do not. Several to whom I have spoken on this point meet me with the remark, 'Photography as a business is played out.' This, too, I do not agree with. I think, properly handled, there is no better business going than photography. It can be made as good to-day as ever it has been, but worked differently. As proof of what I say, I have in my mind, as I write, three gentlemen who, from being amateurs, have become successful professionals, and made good businesses, some starting this very year. I know how they have done it; but, of course, it would not be proper of me to state it publicly. I can say, however, that all they have done and do can be done by any of our first-class houses. There is another gentleman going to join the noble army of photographers, and I can promise you he, too, will do well. Ideas are wanted in photography to make it popular again. Generally speaking, the photography of to-day, as far as portraiture is concerned, is as it was ten or more years ago. If there be any change, it is for the worse. Have the London photographers as much thorough vitality (intellectually) as their provincial brethren? Of course, it is not my place to answer that question, but I would suggest a comparison of the work. Is it as good? will it last as long? Then seek the causes. We all wish well for photography. Its prosperity is important to all in it, no matter what branch he practises; therefore we should all try to better its condition. I will conclude, therefore, by wishing health and prosperity to photography and photographers, professional and amateur, and all the noble army of workers in the art, from the highest to the lowest.

'AN IDEA: AN OPINION.'

By F. J. Scrimgeour.

If there is one thing more than another which pleases an enthusiastic 'camera man,' I think it must be to have a beginner 'under his wing' on a photographic excursion. On these occasions the budding amateur often finds himself wondering if his guardian was nursed in a patent 'Rocker' developing tray instead of a common nursery cradle, and taught the alphabet from the headlines in photographic journals.

There was once a veteran amateur photographer of the deepest dye, who spent the greatest part of the day in his dark room, and dreamt about the relation between nitrate of silver and ferrous oxalate during the hours of darkness.

This 'old stager' was in the habit of giving advice on everything connected with the 'black art' to a young beginner of his acquaintance.

I was that beginner.

Many of his hints were of the greatest value to me, but there were some opinions that he used to 'air' in my presence which I cannot agree with now. One especially I feel I must say something about.

'When you go to any town or village to photograph,' he said more than once, 'the first thing for *you* to do is to make straight for the principal bookseller in the place, and see what photographs of the neighbourhood he has in his front window; then *you* go and take the same.'

My friend's reason for this advice was that time, in the selection of subjects, would be saved.

Then I used to take his hint and pass it on to others; but, *now*, although I certainly try to see the photos in the principle bookseller's window, it is not for the same purpose. No! I do it now in order that I may know what *not* to take.

Why should I expose a plate on what I may get a copy of for sixpence?

Rather take a view on which it would not pay a professional to expose. Little bits of nature; not famous, not notable, perhaps never before noticed by any human being; it is the photographing of these which, in my opinion, forms the working sphere of the amateur photographer.

PRACTICAL HINTS ON VARIOUS SUBJECTS.

By Albert Lévy (Asnières).

I have seen some time ago some complaints in regard to a scum forming on the plate after the last washing. This scum, which is generally in the form of a very fine sandy deposit, can be removed easily by rubbing the surface, before setting up to dry, with the finger's end or a tuft of cotton; then give a last rinse and dry. If this is not done, the surface remains sandy, and the slightest touch leaves a mark. Prevention being better than cure, I would advise washing the plates after hypo in a grooved box, standing the plate on edge, and this defect will not show again, as it arises from washing the plate under a spray of water with the plate lying flat.

Some years ago I have advised, to mount photographs rapidly and well, a piece of linen over the photograph, this covered by a piece of rubber cloth, and the whole rubbed down by a squeegee. I have changed this last tool lately for a rubber roller, and to advantage as regards rapidity and less trouble.

It sometimes happens for different reasons, but never (*of course not*) from a defect in the manufacture of the plate, that the finished negative shows a part less intense than the remainder, and the prints do not show as well as would be otherwise. If only a few prints are necessary, I act as follows: I have a box of, say, 14×17 in. long and deep, and about 4 in. wide. In this box I insert more or less the weaker part of the negative in the printing frame, and, printing in the shadow, I obtain very good results, as I can easily watch both parts as they advance, and a last touch of the whole in full light removes any unevenness.

One more word, and I am through. Some time ago I had occasion to try a well-known brand of films and plates, but found some defects I could not account for, nor any one else, for that matter. Not so the manufacturer. He found at once that it was my fault, however ridiculous his assertion was. The good of it, however, is that I have since found a perfect and most reliable cure for said defect, and, as I do not go in for patents, I give it to you and all free. Do not bother and lose time and money corresponding uselessly with the manufacturer, but return to your former correspondent if you have a good one, and, if not, go to another one that is good and furnishes good plates.

CONCERNING EXHIBITIONS.

By W. Girling.

Amongst the nnmber and variety of questions of all sorts and conditions sent weekly to the journals for answers, some have asked, Of what use are these annual displays—what is their influence and effect? The reply depends upon what is meant by the questioner, who may be one of the utilitarian genus, the base and summit of whose notions are represented by £ *s. d.*

To another the good and use are to him, in their power of suggestion; they set him thinking, striking out a new path, &c.

The following remarks are intended for those whose enthusiasm is great, but whose perseverance is small, and are soon discouraged. Should these lines be read by any one intending to exhibit, or visit an exhibition for the first time, a strange feeling will be experienced as you enter the spacious doorways, under the arches, up the stairs, along the corridors—dim, mysterious, and silent—round the corners, pushing open the baize-covered doors with bated breath, for not a sound can be heard, you are afraid to speak above a whisper, talking not being allowed. Suddenly the last one is passed, and you are *in* the gallery, in the midst of its blaze of light, glory, and beauty; you are filled with wonder, and, if you are modest, you sink into your boots, concluding it will not be of any use for you to compete there. If, on the contrary, you be somewhat conceited (for there are such people about), you will think, I could do better than that, which is quite possible, in some instances at least.

Look at them first as a whole; very soon some will specially claim your attention. Examine them, see *why* you like them, wherein lies the charm, drink in the spirit of them. Half a dozen thus seen will be of more use than a hundred looked at and forgotten a week afterwards. Form your own opinion of them, then you can better appreciate that of others. Some pictures will show you what to do to improve your work,

Remember, you cannot yet render colours in your pictures, but no one of the brush can equal the camera for beautiful and faithful delineation of form and figure; neither can the painter give the delicate lights and shadows seen in a *good* photograph. In these directions you can shine supremely, as many successful examples will prove. Therefore observe, remember, and educate the eye to discern the beautiful, and render that only, leaving the odd and ugly for those who care for such work. Others will, in a marked degree, show you what to avoid; for example, bad clouds—better be without them; a cloudless sky is appreciated in this country, *sunny* landscapes, taken probably with a small stop to get everything in focus, whether near, or half a mile away, producing the effect of gloom and thunder.

If you give a title to your picture, let it be in accord, else make the picture to illustrate the motto. Be sure they agree. Last year a picture was exhibited, called *Startled.* This gave the impression of being carefully posed for the purpose, but utterly failing in the expression. Perhaps she was *going* to be "startled!" One other must suffice, which is the more glaring on account of the claimed superiority of the exhibits. It was in a greenhouse with vines, flowers as per usual in such cases, path in the centre, raised brickwork on either side, upon which, at the left, sat

a *naked* youth, leaning forward and looking down at his toes as though bleeding from the nose. What has a naked figure to do in the centre of a greenhouse? Why not photograph him at the seaside? But to sit *there*, and in that attitude, so highly suggestive of another place, is a bit of as gross realism as could be met with. Avoid all such absurdities.

If you should have an exhibit, and find it placed on a level wtth your knees, or above your head, do not curse the gentlemen composing the Hanging Committee, for no more anxiously distressing work can be done than theirs, which you will understand if you have to take groups where the individuals are not related. One objects to sit, another to stand: 'Put me in front—anywhere but at the side.' These two friends must not be separated, when their height or their dresses demand it. Be thankful your picture is shown at all; its merits will command attention wherever placed. As to medals, if you covet them, you must study the fashion of the day, for sometimes it requires one of Sam Weller's glasses to see the why and the wherefore of the distinction.

Be thankful for all help, go steadily on at what you like best and can excel in; confidence and skill will follow, and perhaps competence as well.

DRYING BROMIDE PRINTS.

By William Fleming.

There are various methods of drying bromide prints, and sometimes one method may prove more suitable than another, as we are unable to be always working under the same circumstances. Sufficient care is not always, however, bestowed on the drying of prints that should be, and many an amateur worker, who is extremely careful about the developing and fixing operations, considers the process of drying of so little importance that the prints are thrown down on any piece of paper or the like and allowed to dry without further trouble on his part.

The usual method of drying prints is to place them face upwards on a sheet of blotting or absorbent paper, and, provided the quality of the paper can be depended upon, this method may be as serviceable as any other. Care should be taken, however, that the blotting-paper is free from injurious chemicals, which are sometimes used in the bleaching process, and not thoroughly eradicated thereafter. Blotting-paper is also objectionable, as it causes an unequal drying of the print.

A simple method, which dispenses with blotting-paper and its attendant evils, may be very easily adopted for prints up to whole-plate size. Stretch a piece of white cord from one point of the workroom to another, and let it be sufficiently long to carry all the prints to be dried. Now, in place of hanging the prints over the cord, as is sometimes done, and thereby running the risk of a mark across the centre, take each print singly, and insert a common pin through one corner outside the margin, which is to be allowed for trimming purposes, and, placing the pin over the cord, allow the weight of the former to counterbalance the weight of the print. In this way the print is kept almost clear of the cord, and, being suspended by the corner, the water is drained off thoroughly. For the larger sizes of prints, two pins may be used, hanging the print by its shorter side.

COPYING FRAME FOR BOOK ILLUSTRATIONS.

By W. P. Wiseman.

There are probably but few amateur slide-makers who have not, at some time or other, desired to reproduce as slides illustrations from books. An early difficulty which presents itself in this class of work I have found to be the keeping perfectly flat and even the page being operated upon. This difficulty increases proportionately with the size and thickness of the book. Many, I am aware, use a large glass-fronted printing frame, pressing the open volume into close contact with the glass. This answers well enough when the book opens freely, and the print being copied is at or near the centre; but it is quite another matter if, as it frequently happens, it is near one end, and the work is tightly bound. Many old and valuable works are so bound, and are, in consequence, very difficult to manipulate. To use force would not tend to improve the book, and might very possibly result in permanently injuring it. A little padding, judiciously applied, helps matters somewhat, but it is tedious, troublesome, and by no means always effective.

As I do a good deal of this kind of thing, it has been a great desideratum with me to find some effective mode of dealing with this matter. After trying various plans, I have at length hit upon an expedient at once simple and highly efficient. It consists in utilising an extra deep printing frame, of the ordinary box type, with plate-glass front, but with *three* sides only. The front of frame, forming the rebate upon which the glass rests, has all four sides complete; this is desirable to avoid the possible fracture of the glass by undue pressure. To obviate encroachment on the plate being copied, that part of the front which extends across the open end should not exceed in width that of an average book margin; sufficient strength can be obtained by increasing the thickness a little. As pressure should be applied as near as may be over the centre of the page, another little modification is necessary in order that the position of the spring may be varied at will. This I have effected by pivoting one end of the pressure bars to a rod of stout iron wire, which extends along the whole length of one side. The other end is secured by a couple of wire catches shaped thus ⌋‾‾‾⌊, the ends, turned outwards, being run through iron staples, in which they revolve. Each of these catches extends about half the length of the side. Each bar thus commands one-half of the frame.

If flat springs, shaped so are used, they must, of course, be attached to the movable bars. Personally, I prefer the spiral springs sold for use in chair seats, couches, and suchlike; these I do not find it necessary to fix at all. To use the frame, raise the bars, and remove the backboard, which may conveniently be in two parts: lay the part of book with the page required on the glass at open end of frame, and slide in until the hinge of book is close up against edge of glass, replace back, adjust bar with spring, and close up. The page will now be found beautifully flat, and the binding of the book is not strained in the slightest degree, the portion not in use swinging freely outside the frame altogether. As the frame is necessarily somewhat deep (mine is five inches), it will stand perfectly of itself, and a couple of strips screwed across one side at right angles with the glass, and arranged to fit

closely to the sides of the copying board, along the sides of which they slide, will prevent all trouble as to parallelism. The above has proved to me a most useful piece of apparatus, and, if home-made, as it readily can be by any one with the most rudimentary knowledge of the use of tools, the cost is but little. My eighteen-inch square frame was a trifle over five shillings; this included glass, which is a piece of what is called "salvage plate."

A FINE FOCUSSING SCREEN.

By W. T. Entwisle.

Take an unused film, or negative, of the size your camera requires, and fix it thoroughly in acid hyposulphite. Wash the film or plate thoroughly, taking care, in this and in all subsequent operations, not to touch the face of the film with the fingers, and then immerse for about fifteen minutes in a one per cent. solution of barium chloride. Pour off the barium solution, and, without washing, cover the plate with a solution of alum, which will precipitate the barium in the gelatine film, as barium sulphate, an exceedingly fine and stable precipitate. Wash well, after ten minutes' steeping in the alum bath, and dry. The strength of the barium solution may be altered to produce any desired amount of opacity. Finger marks at any stage of the process are apt to leave unpleasant and permanent marks on the film.

The above process can also be applied to transparencies after fixing, and, when mounted with plain glass, give a softness that cannot be equalled by mounting an ordinary transparency with ground glass. The white pigment (barium sulphate) is deposited only in those parts of the film not already occupied by the reduced silver salts, so that the result gives a better illumination of the image than is given by the customary ground-glass method.

HAND-CAMERA EXPOSURES.

By Alfred Watkins.

The time when a hand camera was considered efficient with one fixed stop and one fixed shutter speed has gone by. Workers are now awake to the fact that to give one fixed exposure in hand-camera work for all lights and all plates is just as foolish as if the same plan were adopted with ordinary landscape photography. In other words, we now know that it is just as important for the exposure to be adjusted in accordance with the speed of the plate and the power of the light when a shutter is used as when time exposures are given. Another point that the best workers now insist upon is that a high speed of shutter is only occasionally required, and that one-tenth to one-twentieth of a second is fast enough for a good proportion of exposures.

The best class of hand cameras is now provided with means of adjusting both the speed of the shutter and the size of the stop in the lens, and, as plates are now made of far greater rapidity than they were a few years ago, it is often advisable, with a good light and moderate

shutter speed, to use a smaller stop than the traditional *f*-8; but, although we may know that the adjustment of exposure, either by the shutter or by the aperture of the lens, is an important power, the absence of definite information how to exercise this power may still lead to mistakes.

The great variation in the actinic power of the light is the chief cause which influences the required variation in exposure, and many hand-camera men of the first rank (Mr. W. Thomas, for example) use the actinometer provided with my exposure meter as an aid.

Even if used only to judge whether the light is too poor for shutter work, the actinometer will save many wasted plates; for instance, most workers will find that, if the paper takes more than eight seconds to darken to tint, snap-shots will be wasted, but with the slide-rule scale much more definite information can be gained. I have just designed a special pattern of exposure meter, exceedingly small and compact, for fitting to hand cameras as a permanent part of the instrument, so as to be always available without carrying an extra loose article. As it is generally necessary to give a minimum exposure for this class of work, the exposure indicated is half that of other patterns of my instrument, and the circular scale is so designed that, when set for light and plate, the user can see at a glance either what stop to use with a definite shutter speed, or (if more convenient) what shutter speed to use with the stop in use. It projects only a quarter of an inch from the body of the camera, and can be instantly detached for interior work or copying if so required. Of course there is no need to test the light and calculate what stop or speed to use at the very moment before an exposure is made. One or two such tests at convenient times during the day will suffice.

AN X-RAY NOVITIATE.

By John Dormer.

Some photographers are deterred from taking up this new branch of their art by a reluctance to incur the initial expense, and also from an ignorance of what is requisite. But surely in every town there should be an enterprising professional ready to undertake skiagraphic work. There is no need to restrict the art to surgical cases. There are numbers of people who, out of curiosity, would be willing to have photographs of their hands, &c., taken by the X rays if the photographer would include moderate charges for such shadowgraphs in his list of prices; and really there is no insuperable reason why this should be impossible.

Supposing the photographer to be totally unacquainted with the science of electricity, of course he must gain a smattering of it. This may be easily and appropriately obtained from a one-shilling *brochure* on intensity coils by Dyer. The nature and uses of intensity or induction coils, the batteries to use, the meanings of the mysterious terms 'cathode,' 'anode,' and so on, will all become clear by a perusal of its pages. He must not, however, attempt the manufacture of his own coil; *crede experto*, it will be a disheartening waste of labour. The winding on of the primary wire will be simple and encouraging, but then the difficulty begins. *Verb. sat. sap.*, I won't be lured into confession.

Having a knowledge of the subject, the purchase of a coil becomes evidently necessary. One that gives a six-inch spark in air will usually be found large enough, the cost 18*l.* or 19*l.* Smaller coils will not be found satisfactory for quick work. Larger coils will be requisite for those who propose to take photographs of the bones of the trunk or thicker portions of the human frame, with an exposure of moderate length. The photographer must decide whether he is to be able to undertake all kinds of X-ray work, or a limited range of it only. Roughly speaking, the larger the coil the more he will be able to attempt and the quicker he will be about it. Two-inch spark coils *may* be used; six-inch coils *are* most commonly employed. With small coils, other things being equal, the exposure required is of immoderate length.

The next article is the battery. This is a simple matter: Four pickle jars (quarts or larger) filled with chromic acid solution, eight slips of carbon, and four slips of zinc, obtainable at any retail electrician's, a dozen brass binding screws, and a half-dozen yards of thickish copper wire (No. 16 or 18). With the knowledge derived from the above *brochure*, and the manipulative experience of a 'handy man,' an efficient battery can be put together for 10*s.* The actual cost of my own was as follows: Four large pickle jars, 1*s.* 8*d.*; four elements (each of two carbons and one detachable zinc, fitted on a strip of wood wide enough to rest on the lips of the jars, and provided with binding screws), each 1*s.* 6*d.*; two pounds chromic acid, 2*s.*; total, 9*s.* 8*d.* This does not include the wire and the tray with lifting arrangements, which I manufactured from an old packing case. Such a battery gives a powerful current, and no waste occurs when it is not in use, on account of the elements being suspendable. Of course, when possible, the current from the main may be employed. Before doing so, however, the advice of an electrician should be sought, for otherwise the coil is almost certain to be ruined.

The third, and last, item is the vacuum tube, exhausted to the requisite degree, and of the proper construction. As success depends upon the quality of this tube, it is advisable to buy one of a first-class house, price 27*s.* 6*d.*, or thereabouts. Clear instructions are usually given with each tube.

With the above outfit a great deal of satisfactory work may be accomplished. Splendid shadowgraphs of the internal skeletons of small animals may be obtained. I suggest that the internal anatomy of many prize pets would prove an interesting study. The professional photographer might schedule, too, his prices for shadowgraphs of the skeletons of favourite cats—under guarantee that the cats be complaisant, be it understood. With regard to such animals as bulldogs, of course the photographer must exercise his discretion. It occasionally happens that *they* betray an unseemly desire to explore *his* internal anatomy.

Though perhaps somewhat digressive, I should like to remind possessors of Wimshurst Influence machines that, with the ordinary X-ray tube, they can take capital shadowgraphs. With a fifteen-inch plate machine in my possession I obtain fully exposed skiagraphs of the hand in twenty minutes. In this case the expense of the outfit is considerably less: Wimshurst machine, 3*l.* 15*s.*; tube as above—total 5*l.* 2*s.* 6*d.* There are various reasons, however, why the induction coil and battery are preferable.

WARMING THE SOLUTIONS IN THE DARK ROOM DURING COLD WEATHER.

By W. K. Burton, C.E. (Tokio, Japan).

Though I write at a hot time of the year, and in a part of the world where the heat is such as is never approached in England, this will be printed at a time when it is likely to be cold enough with you, and when photographers will probably be struggling against cold solutions of one kind and another.

It applies to nearly all photographic solutions that they work best at a temperature between 60° and 70° Fahr. The sensitising bath for carbon tissue is one of the few that is, perhaps, better at a lower temperature than 60° Fahr., though this is doubtful. It is specially about the developing solutions and those used afterwards that I write.

It goes without saying, that the best arrangement, where it is possible, is to keep the developing room constantly warm. A means of warming the water as it enters will be mentioned a little further on.

It is not every one, however, who can manage this. During the last nine years I have worked, three years each, in three different dark rooms, each about 16 × 18 feet in size, and in each case heating has been out of the question, or, what comes to the same thing, beyond my means. During winter the rooms have generally been below the freezing point both night and day, except after an hour or two of developing, when the temperature would rise a few degrees. The hypo bath would generally be found frozen in the morning. This makes developing for a whole day, as on returning from a trip, a very trying ordeal, and it may be of interest to some of your readers to know what makeshifts have been used to keep solutions at a proper temperature.

In the first place, let me say that we have a great convenience in Japan in a sort of charcoal brazier, called *hibachi*. In this a certain quantity of charcoal—from a few embers, such as are used in the pipe-lighting hibachi, to quite a mass of charcoal—is kept constantly aglow. So convenient are these that I shall here tell how one could easily be made. Let a common flower-pot of the truncated sort, say eight inches diameter, be taken, and a wooden box, without lid, large enough to hold it be made, the space between the flower-pot and the box being filled in with sand. The flower-pot is filled with wood ash to within about an inch of the top. A few lumps of charcoal are put in a clear fire till they are red-hot, and are then piled on the wood ash in the centre. It is only necessary to add charcoal and a pleasant glow will be kept up indefinitely.

Unless a room is absolutely without ventilation, there need be no fear of 'charcoal poisoning.' The combustion is complete. No carbonic oxide (CO), which is highly poisonous, is given off, but only carbonic acid (CO_2), which may be present in very considerable quantities without doing any harm.

When beginning a long day's work, several hibachi are always in the room. One is placed under the developing table—I do not develop over a sink, but on a pendulum board over a table. This helps a little to keep things warm, but its greatest use is in the comfort it gives, preventing the feet from getting frozen. Over another hibachi a kettle of water

is kept continually boiling; and there is a third for odd purposes. There is also a plentiful supply of hot water in a boiler outside the dark room.

Of course, the developing solution is the most important, for, if this is too cold, not only is the process intolerably slow, but the results are inferior.

If only one plate is to be developed at a time, the matter is very simple. The measuring glasses are all kept lying in a small tub of tepid water. The solution is made up to the right temperature simply by using some water from the kettle. I suppose a thermometer ought to be used, but I confess to judging of temperature by dipping a finger in the solution. A thing not to be forgotten is to rinse out the bath with hot water just before beginning development, so as to warm it, otherwise it will extract much heat from the developer before development is finished.

This is a very simple thing, but it is my custom—working 12 × 10—to make up a large quantity of solution, generally fifteen ounces, at the beginning, and to use it over and over again, adding fresh ingredients as they may appear to be wanted. This gave some trouble till I hit on a very simple way to prevent the solution from cooling. A porcelain developing dish is used. After one plate has been developed the solution is poured back into the measuring glass, and some boiling water is poured into the developing dish, where it remains a minute or so, when it is poured off. The heat of the dish is communicated to the developer, which is thus kept warm, and I have thus worked with the same solution for several hours. The system involves keeping the developing dish clean, which is of importance. Keeping the measuring glasses in the tub of boiling water has the same effect on them. There is a bath of bromide at one side into which to dip plates that appear to be over-exposed. Should a plate appear to need forcing, a little developer, ready but for the addition of some hot water, is flowed over the said plate whilst it is held in the hand.

A frozen hypo bath will, of course, not work, but, apart, from the coldness of the fixing bath, is not so fatal as in the case of the developer, yet it should be avoided, as a cold hypo bath fixes with intolerable slowness. This is not in itself so great an evil as is the secondary one, that, from lack of patience, there is liable to be under-fixing. A very crude way of warming the fixing bath is to throw a handful or two of hypo into it from time to time, and to add boiling water till the solution is no longer absolutely cold. I may say that I use a large fixing bath, so that several 12 × 10 plates may be placed in it at one time. If full, there would be five gallons of solution. In working, there is generally from one to two gallons. A far more scientific method is as follows: A certain amonnt of hypo and water are mixed in the proportion of one to three, are placed in a saucepan and brought to the boil. The boiling solution is then added to the hypo solution. By this method a comparatively small quantity of hypo and water is needed. The boiling point of the solution is considerably above 212° Fahr., and the solution contains much more heat than would mere water at the same temperature as under pressure.

Of course, either method, put in operation from time to time, adds to the bulk of the bath, the excess having to be poured off; but this is a good thing. Hypo is cheap, and the bath is kept clean and clear.

The sensitising bath is warmed by placing it on a frame table with a hibachi under it. There is no danger that the gentle heat of the charcoal will crack the porcelain.

The water for general purposes is warmed by receiving it first into a small cistern fixed above the level of the washing sink. Hot water from the boiler is poured into this cistern from time to time to keep the temperature up. This will seem to folks at home a crude method indeed, but it works.

WRINKLETTES.

By F. J. Mortimer.

You are cleanly, and dislike stained fingers caused by dabbling in amidol, pyro, or silver, &c., and finger stalls are inconveniences that tear easily. Try what enamel collodion will do :—

Pyroxyline	6 grains.
Methylated ether	½ ounce.
Methylated alcohol	½ ,,

Dip the fingers in, and let dry, which happens in about ten seconds ; then proceed to dabble, and remove the collodion when finished with spirit. The result will surprise you.

You are decorative, and wish to adorn the back-parlour windows, and dislike the two-sheets-a-penny-green-and-pink-dicky-bird or patchwork-quilt-effect type of transparencies. Try bromide prints which have been developed very dense, and stripped and enlarged with cresco fylma. They should be applied wet, and handled carefully, or else——

You are inquisitive, and dislike mysterious blotches appearing on negatives during development. Try not to look so often at the negative against the ruby light. The heat from the lamp or the hand, if held too long, causes the developer to partly dry in places, and hence the blotches.

You are economical, and dislike throwing away your hypo fixing bath, even when thick enough to stand alone. Try putting citric acid, about eighty grains to each quart of dirty hypo, in a clean glass bottle, and stand it in the sun for a day or two. Then filter, and add a little ammonia to make it alkaline again. You will be astonished.

You are neat, and dislike seeing the black rubbed off your camera, &c. Try what black lead and starch mixed with water, or lamp-black, mixed with sufficient French polish to make it adhere, will do.

You are consistent, and dislike using developer for toning a batch of pet prints, because of the labels having been washed off the bottles. Try painting the names on the bottles with :—

Shellac in solution	2 ounces.
Borax	1 ounce.
Water	10 ounces.

and sufficient flour of emery or rotten-stone added to make it dry with a dull surface. Will outlast the average bottle.

You are artistic, and do not dislike Bartolozzi red prints. Try printing on cyanotype paper (blue process), and then immerse the print in a weak silver nitrate solution, and thoroughly wash. The colour will be a revelation. The silver solution may be cleared when dirty by adding a little washing soda, and putting bottle in sun until sediment has deposited, and then filter.

FIXING PRINTS.

By F. T. Bennett.

I was recently asked how to tell when prints are fixed, and, if I remember rightly, the same question was asked in an examination paper some time ago, but I cannot call to mind having seen a satisfactory answer to the question.

My method is simple, and, as it were, 'kills two birds with one stone.' Most of us have had, at some time or the other, a box of plates not up to standard (though plates, as they are now turned out, are wonderfully uniform), or have had the misfortune to get them light struck. I had some of the latter (large size) which I tried to doctor, but it was far from satisfactory, and resulted in more bad language than good negatives. Get a cheap glass cutter, and cut the plates into pieces about an inch square, and, when fixing prints, put a piece in at the same time; you can then be pretty sure that, when the plate is quite clear, the prints are thoroughly fixed. It is a good plan to use two fixing baths, and I am of opinion that half the trouble of prints fading, going spotty, and yellowing, is caused through insufficient fixing.

ACETYLENE FOR PHOTOGRAPHIC USES.

By T. N. Armstrong.

There seems little doubt that the discovery of acetylene gas marks a new era in photography in so far as artificial lighting is concerned.

The extremely simple manner in which this new gas is generated, no doubt, forms one of the chief advantages to its general adoption, for already almost every optician and photographic dealer in the United Kingdom has some form of generator in stock for the benefit of their customers.

To say that an absolutely perfect generator has as yet been produced would, perhaps, be going too far, for in the short time since this important discovery was made known to the world much has had to be learned by experimentalists regarding the best means of producing this brilliant light.

There seems little doubt, however, that any drawbacks or shortcomings in the earlier form of apparatus employed in its introduction will be entirely overcome, and, before long, absolutely perfect machines placed upon the market.

In some particulars important improvements have already been effected, and the form of apparatus now supplied by a leading firm, which, although somewhat expensive, lifts the utility of acetylene far and away beyond the sphere of laboratory experiments into that of actual practical and domestic value.

One of the first improvements to be noticed is the double auxiliary generator of Messrs. Read, Holliday, & Sons, Limited, of Huddersfield.

This is a most important advance on the earlier form of generators, and consists of double basket chambers, in which the gas is generated automatically. As soon as the calcium carbide in one basket becomes spent, the machine, of its own accord, brings another generating chamber

into play, by which means a steady and continuous supply of gas is always at command, and entirely disposes of one of the earliest draw-backs, viz., having to cut off the light to exchange a basket.

These machines are made in all sizes, the larger ones feeding a very considerable number of jets, situated at varying distances from the generator.

Of course, as is generally the case with all new discoveries, much has to be acquired from practical experience. Acetylene is no exception to this rule, for there is no doubt one of the main difficulties has been with the burners when using this gas. This trouble has, however, been likewise overcome. The firm previously mentioned has, fortunately, hit upon a special form of burner, in which there is no clogging up of carbon. It would appear that the illuminating power of acetylene is much increased by the addition of a certain proportion of air to the burner. This discovery has been utilised in the special form of burner above referred to.

The writer quite recently saw a series of test experiments carried out with burners of various patterns, and the one in question quite overshadowed all the others, being at the same time absolutely free from any clogging or smoke at any pressure.

The rushing of numerous small-sized generators on the market, several of which are considered by expert mechanics to be far from perfect, either in design or make, may very possibly tend to prejudice some users against the adoption of the new light. With those workers, however, whose experience relates to the more expensive, but perfect, machines, only one opinion is likely to be formed, viz., that of unqualified satisfaction at the utility of acetylene.

For portraiture, when used under suitable conditions, it is of great value, while for enlarging purposes, and as an adjunct to the optical lantern, it is destined to supersede the old form of oil lamp and also the more modern incandescent form of gas burner.

When speaking of optical lanterns, for many years back I have noticed a growing disposition on the part of lamp-makers to reduce the size of their lamps, sacrificing utility for bulk. In oil lanterns especially is this the case, and I question very much if the small-bulk lanterns of the present day are as good as the larger class that were found so serviceable fifteen years ago.

As was to be expected, quite a crop of objections have been raised against acetylene on the score of its action on copper and iron piping, and the uncertainty of a given quantity of calcium carbide yielding a similar supply of gas twice in succession.

As to the latter objection, no doubt there are good and bad samples of carbide being placed upon the market, just like good and bad coal; and, if inferior carbide be used, it is only reasonable to expect inferior results from the same.

The objection as to the action of the gas on copper, brass, and iron piping has recently been considered by competent experts, who find that this objection does not hold good either, for, after a continuous action of the gas on certain qualities of piping, it was proved by actual weight that no perceptible deterioration had taken place.

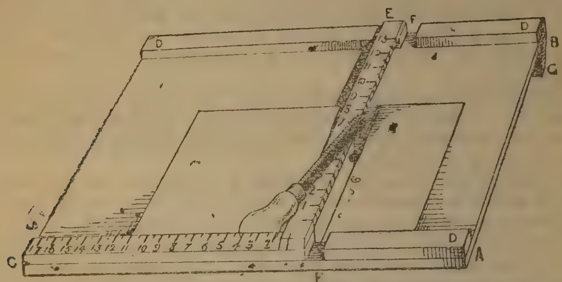
Acetylene seems a very healthy and promising baby, and, if properly nursed, is certain to grow up into vigorous manhood.

A ZINC CUTTING BOARD.

By E. C. Middleton.

The marking and cutting up of sheets of zinc, brass, or copper, are operations that, in small establishments devoted to process work, often occupy considerable time. The subjoined sketch shows about the simplest and handiest assistant for the purpose. It ensures the metal being cut square and to size without the use of the ordinary square or rule, and to many it will be found a great convenience.

The sketch is not drawn to a consistent scale, that certain details may be bolder, the board should be wide enough from A to B, say



21 inches, to take a sheet of metal. The length from A to C is of no great consequence, say 24 inches. The parallel strips, D D, should be about a quarter of an inch above the board, and support the cutting guide, E, which should be about 1½ in. wide by 1 in. deep, carefully placed at right angles to the strip D. The inches marked, as shown, enable the user to cut the size easily. The notches, F, allow of cutting to the very edges, and the stop, G, will catch over the back of a table or bench, or it may be omitted, and stops placed on the bench for the edges of the board to butt against.

A SILVER PRINT WHICH HAS RETAINED ITS ORIGINAL FRESHNESS TWENTY YEARS.

By W. Hanson.

If a suggestive fact is worth recording, I have still in my possession a vignetted portrait (size 15 × 12) of the Right. Hon. W. E. Forster, which is as pure, fresh, and vigorous to-day as it was when I sent it in the year 1876 to the Philadelphia International Exhibition, now quite twenty years ago. But this alleged fact suggests nothing useful to others without a statement of the particulars relating to the production and preservation of the picture. The particulars are these: The picture was printed on Trapp's albumenised paper, and toned in the usual acetate bath, but fixed in *two* hypo baths, of equal strength, instead of one. It was mounted with starch on strong cardboard, the back of which was varnished with a solution of shellac in alcohol.

With the intention of protecting the picture from the effects of the sea air and exposure at the Exhibition, the glass of its frame was carefully 'lined in;' the backboard varnished with the above varnish on both sides, and the brown-paper cover all treated in the same way; in short, every part of the back of the frame was varnished.

ANOTHER YEAR WITH THE HAND CAMERA.

By H. P. Robinson.

It is my experience that it is easier to write an article on a subject of which you know nearly nothing—and I fancy others are quite aware of this useful fact—than on one with which you are saturated and know to the depths. Curiously enough, if these inexperiences are not put forward too barefacedly as expert evidence, which undoubtedly they sometimes are, they often appear of more value than the assured pronouncements of the skilful. We always learn more from our mistakes than our successes, and there are more mistakes—of others—than successes to learn from. Looked at from this point of view, this ought to be a valuable article.

Now, it seems to me that it must take many years to learn all about a hand camera, even if you confine yourself to a single one, and I have had only two years' experience of mine. Having stated this, I think I have justified my right to preach and teach on the subject. All teaching seems to be getting simpler than it was, and one cannot help suspecting some of the papers on art lately written by scientists to have been produced after a hasty glance at a misunderstood book, to 'fill an evening.'

But, although I have possessed my camera for so short a time, I have had considerable practice with it. As the singer said of the soap, I have 'used no other,' not even for a single negative; a cheap hand camera fills all my modest wants. The system of pictorial photography is changing. The hand camera registers, a little hole in the dark room works it out. I have used this particular instrument so much that I am afraid I am wearing it out, or grinding part of it into dust, for my negatives are occasionally covered with little black spots, which are the very ——— I must go to a scientist and ask him whether this is dust in the dark room (perhaps from spilled chemicals), or the grinding of the sheaths by the plates, or the wearing of the changing machinery, or —— No, I will not suggest anything. It is the scientist's business and delight to find out these little things, it is mine to take up the machine again after he has exorcised the villainous spots by perhaps simply cleaning it, and using an antiseptic, or something with a long name.

The camera, as is well known, does all the work, I only fill it with plates; therefore I can praise its actions without being egotistical. It has done wonders; but, as everybody else's camera has done the same, I need not give a list of them. Its greatest achievement was to convert a great painter I met on the beach to the doctrine of impressionism in photography, illustrated by example. I took his portrait with just a little bit of a jerk of the camera as I exposed (it often does that for itself), and the result was a triumph. There is the life and the soul, and his shadow before him on the sands, but no features. Features are to become obsolete, they are superfluous, likeness can be produced without them.

Many of our great painters now look upon the hand camera as the most artistic and delightful toy they could have, and also know how to use it on a holiday; but I wish they would not call them all Kodaks, because it shows want of knowledge and inadequate observation. A camera is harmless in the hands of a good painter who does not want its help; it is only the fifth-rate painter, and his friend, the hand-to-mouth critic, who use and abuse photography.

As the *Edinburgh Review* said of Wordsworth's 'Excursion,' 'this will never do.' I set out to write a really practical article, as requested by the Editor, and have got to the end of my space before the formulæ and exciting incidents begin. They must be left until next year. But this I must say, My old camera will not do for me any more. It has a very dreadful fault; it is economical, and economy and photography should never run together. It only carries a dozen plates, which are soon used, and then there is a compulsory cessation of inspiration until I can return home and change. Now, in my youthful ardour, my plates are gone almost before I ought to have begun to work. I am a multitudinous exposer when my blood is up, and I want to have the means of destroying as many plates as I like. I want a camera that will allow me to change by dozens; one dozen down, another come on. I know something of the sort is done, but always beyond the reach of a wise man's pocket, even if he is not economical. It ought to be possible, by suppressing useless detail and parts, to supply a good working tool with an adequate lens—no man who knows how to do good work requires luxuries in lenses—changing boxes, focussing arrangement, rising front, and brilliant finders, for, let us say, ten pounds. I do not think this is done. I shall wait till it is, and then go on again.

FAST *VERSUS* SLOW PLATES.

By W. T. Wilkinson.

A few years ago the best negatives were those made upon plates of slow or ordinary speed, rapid plates only being tolerated when circumstances were such as to put ordinary plates out of court. Now it is entirely different. Rapid plates will yield negatives as good as the best ordinary or slow plates, providing due caution is used to give the proper exposure. I have been out this last summer with my slides filled with ordinary plates, and on account of wind would have had to abandon hopes of any work, but, having rapid plates and a changing bag with me, removed the slow plates and substituted the rapid ones, and I was able to get all I wanted. On other occasions, having both fast and slow in the slides, I have been able to judge of any difference in quality between fast and slow plates by making exposures on the same subject, and have negatives that cannot be distinguished one from the other. When, therefore, the quality of result is the same in both rapid and slow plates, the landscape photographer will find it to his advantage to choose the rapid.

As my outdoor work is not of the serious or commercial kind, I am not bound down to one make of plate; therefore, I have seldom gone out twice with the same maker's plates. At first this practice led to uncertainty as to exposure, as, whatever may be the merits of the Hurter

& Driffield or the Warnerke systems of speed-marking, they only give a comparison between their respective degrees, *i.e.*, 100 Hurter & Driffield has no comparison to 20 Warnerke, and, as only a few makers even use these systems, the utility is still further discounted; but, after investing in an exposure meter, I experienced no difficulty in getting correct exposures under all circumstances and on any make of plate. Plate-makers who do not mark their plates should give the system used by Watkins & Wynne a trial, and mark their plates accordingly, and I venture to say they would find it much more appreciated than Hurter & Driffield's or Warnerke's.

SOME HINTS ON PHOTOGRAPHING INTERIORS.

By George T. Harris.

Interior photography is full of charm to a great many photographers, amateur and professional; indeed, the reputation of some rests solely on the excellence of their work in this direction. Various items of manipulation that do not enter into the more popular branch of landscape photography are necessary to the successful prosecution of interior photography, and they are just these apparently trivial details that go so far towards ensuring success. Most workers of any experience will gradually arrive at a system of procedure that makes superfluous the details of any other person's method of working, so that it is entirely for the inexperienced workers at interior photography these hints, culled from a somewhat long and varied experience in this class of work, are given.

The apparatus for work of this description deserves very careful consideration, and a judicious selection will do much towards obviating both discomfort in working and unsatisfactory results. It is almost a *sine-quâ-non* that the square form of camera be chosen with parallel bellows; conical bellows for interior work are provocative of 'language,' and, as nine-tenths of interiors are ecclesiastical, embroidered language is as a white elephant to its possessor in these spots. Hence, avoid conical bellows. If you are using a wide-angle lens with a camera having conical bellows, it will be found almost impossible to use the rising front to its full extent without the bellows cutting off some portion of the subject. A light square camera with parallel bellows, generous amount of rising and falling front (falling is equally essential as rising), and a good swing back is the ideal camera to use in interior, if not, indeed, in *all* work. One drawback to this form of camera it seems desirable to mention, though some makers seem to have recognised and removed it; it is the difficulty of focussing comfortably when using a short-focus lens, owing to the projecting tailboard. This is, without doubt, a serious inconvenience, and should be borne in mind when selecting apparatus.

The stand should be firm and of good height, two qualities conspicuously absent from the majority of stands in the dealers' stocks; the legs being capable of adjustment to varying heights. My experience of tripods is, however, very depressing; for, while the makers have lavished a prodigal amount of ingenuity on the perfection and movements of the camera, the tripod seems always to lack the two simple attributes of

stability and height. Personally, I find an average height of nine feet from the floor desirable for most cathedral and allied subjects, and this is readily obtained with a good stand by impressing the service of three chairs upon which to place the tripod, while a fourth enables the operator to reach the height of the camera. Loose chairs are usually to be found in some corner of cathedrals and minor places of worship, and it will conduce to pleasant intercourse existing between photographer and vergers if they are replaced where they were taken from when further use is not desired. This hint is given in the interests of photographers generally, from observing the vast amount of unnecessary trouble given to vergers by the thoughtlessness of photographers in deranging articles without the least attempt afterwards at restoring them to their proper places; thus irritating the staff and rendering them less willing to assist future photographers.

A selection of lenses with a fairly extended range of foci is quite as necessary for interior as for exterior work, especially when buildings of great length are the subjects; it should always be the aim of the worker to adjust the lens to the subject, and not the converse. Carefully study the subject and decide the amount it is desirable to include, then select a lens with a focal length capable of giving just the amount wanted. A common error in dealing with buildings of small dimensions consists of an endeavour to obtain as much as possible of the whole interior, with the result that some truly fine feature is dwarfed and rendered insignificant in order that a wilderness of uninteresting structure may be crowded into the negative.

Take, for an example, a parish church in Devonshire; they are usually Perpendicular churches of small interest architecturally (this refers solely to the interior; the exteriors are, as a rule, extremely fine), but possessed of really magnificent screens, often rood screens, with, possibly, close to the screen, a pulpit of similarly ornate design. It is not the number of bays in the church that the interest centres in, but the beauty of the screen, with just the number of bays to indicate the style and decoration of the architecture, usually two will be ample. By choosing your standpoint well back in the nave, and employing a lens of long focus, you will thus avoid the evil consequences of short-focus objectives, and find the adjustment of the camera less difficult than when a position nearer the screen, necessitating a shorter-focus lens, has been chosen. On the other hand, in some of our cathedrals with Norman naves, especially late Norman work, it is most important to show as large a number of the bays as possible, owing to the diverse ornamentation that obtains, the arches of one bay being possibly all zigzag work, while those of the contiguous arch will be the billet and lozenge, &c., the capitals being even more dissimilar. In this case it is necessary to get as much of the nave as possible, short of actual distortion. There is always some particular point of interest or beauty to be insisted on in architectural views, and this should be clearly decided upon before work is commenced, and everything else made subsidiary to it.

Much has been said and written on the subject of halation, the remedy for which has long been a very simple matter if only the plate has been chosen judiciously. Backing a plate is, when properly performed with a well-made backing, such an absurdly easy operation that it is difficult to account for the pages and pages of literature on the subject.

For a long time now the present writer has used a caramel and spirit backing upon an orthochromatic plate, and such a thing as halation never presents itself, however crucial the test. The application is easily made, it dries in a very few minutes, and may be allowed gradually to wash off during the process of development without any deleterious effect on the plate.

All things considered, there is no finer developer for this class of work than pyro and ammonia, and a ten per cent. solution of bromide standing by in a graduate with a medium-sized camel's-hair brush is a useful adjunct for retarding the development of such intensely lit portions as windows. A window brushed with a ten per cent. solution of bromide several times during development will have the details of the glass beautifully preserved from over-development; in fact, brush development is almost a necessity in many subjects if the best result is desired.

The lighting of interiors is a matter of extreme importance in securing the best result, and demands careful study before commencing work. Patches of actual sunlight are to be avoided, but it does not follow from this that it is desirable always to photograph interiors on dull days, which is an impression somewhat widespread. A brilliant light exteriorly, when broken up and diffused by passing through stained-glass windows, gives the most superior results, the mouldings and ornamentations are thrown into sharper relief than when photographed in a dull, diffused light. Avoid taking general views of interiors from the west end when a large window in that portion of the building gives access to a flood of afternoon sunlight, the result is deplorable.

Interior work requires care and patience far beyond that necessary for landscape work, and the failures in early days are proportionately larger; but, when experience in this class of work is attained, the remuneration for much disapppointment is ample, especially when a knowledge and love of architecture are added to photographic ability in this direction.

ENAMELLING AND MOUNTING STEREOSCOPIC P. O. P. PRINTS.

By W. E. Leek.

In spite of what many term the 'inartistic gloss,' there is nothing to equal a properly enamelled and mounted print on gelatino chloride printing out paper, for bringing out the inherent beauties and detail of a stereoscopic picture. Many are deterred from enamelling their prints, owing to the numerous failures caused by the prints sticking to the glass and the difficulty of mounting them after being enamelled without smearing or damaging their highly glazed surfaces.

The method I adopt is so simple and gives such uniform good results, that I am induced to give my *modus operandi* for the benefit of my brother workers.

I take a piece of plate glass as free from flaws as possible, and well wash it with hot water and soap, and then rub dry. I then repeat the operation, but this time use plain hot water; after drying, I rub all over

the glass a little *furniture cream*, polish off with a dry rag, and then go over it a second time with another rag perfectly clean and dry. The glass is now ready for mounting the prints on, but is better if laid aside for a little while; I generally prepare my glasses the day before I wish to use them.

The prints, after being taken direct from the last washing water, are laid on the glass and gently squeegeed down, so as to exclude all air bubbles, and the glasses then set on end to dry; when dry, they will strip quite easily.

After stripping I trim to the shape required and mount them by spreading just a thin line (about one eighth of an inch wide) of glue mountant along the extreme edges of the print, using for this purpose, *not a brush*, but a *match stick* or *small nail.*

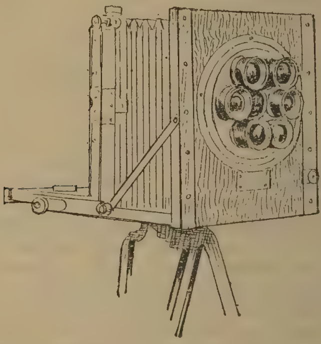
Place in position on the mount, cover with a piece of thin smooth macintosh or clean paper, slightly squeegee and place under light pressure to dry. The pictures are, however, further improved, and the stereoscopic effect considerably enhanced, if in addition, a cut-out mount is laid on the top.

You will find this mode of working very simple, cleanly, and efficient, and will be pleased with the results.

A CONVENIENT FORM OF CAMERA.

By A. L. Henderson.

The camera front consists of revolving discs composed of three layers of aluminium. By this arrangement any lens (or pair for stereoscopic



pictures) can be brought into action, all others being automatically shut It has the usual rising front, and it can be reversed in case very short-focus lenses are required, or for portability in packing. The camera was made by George Hare, and the metal work by Mr. Stone, of Gloucester-street.

HALF-TONE OR WHOLE TONE.

By William Gamble.

Why should the half-tone process remain a method of reproducing half-tone with more or less degraded high lights and greyed shadows? We live in a progressive world where half measures are not wanted; and the half-tone worker, who wishes to be up with or ahead of the times, should aim at making his blocks not '*half*-tones,' but '*whole* tones.' I admit that he would be beset with difficulties in endeavouring to accomplish it, but every attempt to depart from the beaten track must be beset with difficulties, and the successful men are those who have the patience to overcome them.

The chief obstacle in the way of a whole-tone process is the letter-press printer, who, in the majority of cases, is unable to print a half-tone block with pure whites without leaving a ragged edge to the half-tones. If one could be sure of getting the blocks printed, so that the half-tones graduated off smoothly into pure white, it would be comparatively easy to make a whole-tone block.

For instance, we can so adapt the stop and screen distance that the high lights are closed in to full opacity instead of dots. We can do this, for instance, by using a large stop during part of the exposure towards the finish. This will entirely neutralise the effect of the screen in the high lights without much affecting the shadows. The same effect may be obtained by increasing the screen distance beyond the limits of sharpness during part of the exposure.

Not so long ago a patent was taken out for a method of securing pure whites by removing the screen altogether during part of the exposure. This operation, if not unduly prolonged, would cause a blackening over of the high lights of the negative without harming the shadows.

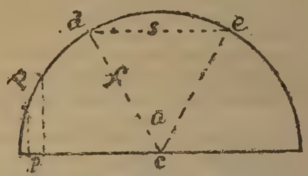
Another ingenious idea we saw recently described was to make the screen exposure as usual, develop, fix, and wash, and dry plate. Then, to flow it with indiarubber solution, collodionise it again on top of this, and resensitise. The plate was again placed in the dark slide, means being adopted to ensure registering the picture in exactly the same place. The screen is withdrawn, and a further exposure, much shorter than the first, given, so as to only act on the high lights and slightly on the half-tones. The effect of this would be to block out the half-tone dots in the high lights and give a slight veil which would hold back the half-tones till the shadows had acquired full strength. Practical workers may judge for themselves as to the likelihood of success in such a process.

My own opinion is that the best method would be to adjust either the stop or the screen to give the effect, and leave the rest to the printer and etcher. The latter can do a great towards securing whole tone, and with the aid of the routing machine or deep etching the whites can be got to print clean. For the rest, we must look to the letterpress printer to tone down harsh edges by judicious overlays. As there are a few printers who can undertake to turn out vignetted half-tones satisfactory, and their number is increasing, we may look to a more extended use of 'whole tone' in the near future.

DEGREES OF ILLUMINATION BY VARIOUS APERTURES.

By R. H. Bow, C.E., F.R.S.E.

If we assume the sky hemisphere to be uniformly brilliant, and ignore direct sunshine, the effect of any area of it, such as P, in illuminating a



horizontal surface at c, is measured by the area of its projection, p, on the base plane; and the efficiency of any circular opening, $d\ e$, or of the cone, $d\ c\ e$, the axis of which is at right angles to the surface at c, will be equal to $0{\cdot}7854\left(\frac{s}{f}\right)^2$; but it will be more convenient to omit the fraction 0·7854, and calculate the effects as proportionate to $\left(\frac{s}{f}\right)^2$ simply. Calculated thus, the illuminating power of a cone with the angle $a = 60°$ becomes our unit.

Efficiency of a cone having a	=	60°	= 1·0.
,, ,, ,,	=	90°	= 2·0.
,, ,, ,,	=	180°	= 4·0.

The last is, of course, the effect of the whole hemisphere, and it is to be noted that f has to be measured from the *edge* of the aperture s.

When a printing frame is placed horizontally at the foot of a high wall, or placed vertically against the wall, it will receive the light from one-half only of the sky, and the intensity will therefore	= 2·0
But, when it is inclined at 45°, so as to face the exposed sky in the most efficient manner, the intensity of illumination will	= 2·83
When the frame is placed horizontally in the angle formed by two perpendicular walls at right angles to one another, it will receive the light from one quarter of the sky, and the efficiency	= 1·0
And, if it be fixed vertically in the corner to either wall, the effect is also	= 1·0
But, when it is inclined at 45° to one of the walls, the efficiency rises to	= 1·414
And, when inclined in the best way to face the exposed sky, the illumination is nearly	= 1¾
The largest cone that could be fitted into such a corner will have its angle = 70° 32′, and the illumination would amount to ...	= 1⅓

Of course, since the lower sky is usually less brilliant than the upper, and more or less hidden by intervening objects, these valuations would

require to be much modified in practice; but the estimates of the smaller cones may be found useful, not only in printing, but also in camera work.

The necessary time of exposure will be inversely as the illumination, or in proportion to $\left(\frac{f}{s}\right)^2 = T$. The values of T are sixteen times greater than the standard numbers adopted by the Photographic Society in 1881 for the stops or diaphragm apertures.

TABLE GIVING THE INTENSITIES OF ILLUMINATION AND VALUES OF T CORRESPONDING TO SOME VALUES OF s.

T = Proportional time of exposure

$$= \left(\frac{f}{s}\right)^2; \quad s = \text{diameter of aperture} = 2 \sin \frac{a}{2}$$

		Angle of Cone a.	Intensity of Illumination.	T.
Whole Hemisphere $s =$	2·000 f	180°	4·000	0·25
	1·414	90°	2·000	·50
	1·1547	70° 32′	1·333	·75
	1·000	60°	1·000	1·00
	0·7654	45°	0·586	1·706
	0·707	41° 24′	0·500	2·000
	0·5176	30°	0·268	3·73
	0·500	28° 58′	0·250	4·00
Photo. Soc. unit ... $f =$	4·00 s	14° 22′	·0625	16·00
	5	11° 29′	·04	25
	6	9° 34′	·0277	36
	7·07	8° 6′	·02	50
	8	7° 10′	·0156	64
	10	5° 44′	·01	100
	16	3° 35′	·0039	256
	32	1° 48′	·000976	1024

The great illumination when facing the sky suggests the position of lying on a sofa out of doors, as suited for instantaneous portraiture.

A RIGHT-SIDE-UP VIEW-FINDER.

By F. H. VARLEY.

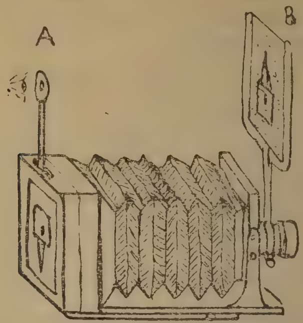
THE experienced photographer, from constant practice, is not much disconcerted by viewing the inverted image on the ground-glass screen, still I believe it will be conceded that there are occasions when it might be desirable to see and arrange the subject and view it the right way up, especially in the setting of a landscape picture.

The simple device of placing a piece of looking-glass at an angle of 45° from the vertical at the back of the ground-glass screen, and looking

downwards, presents an image erect in one direction only, the sides remaining reversed, right for left.

To meet the difficulty, and not to add much weight to the photographer's kit, I suggest the following:—

Take a piece of fine and closely perforated cardboard or wire gauze of the finest mesh obtainable; cut it the same size as the glass screen, say, for instance, $6\frac{1}{2} \times 4\frac{1}{2}$ in. If this is held in front of, and at eight inches distance from, the eye (assuming the equivalent focus of the camera



lens to be eight inches), it will be found to cover exactly the same extent of view. In this way the perforated cardboard or fine gauze may be used as a view-finder. Its application to the camera is very simple: A clip, fitting on the lens tube, carries a light vertical frame, in which the perforated screen slips. At the back of the camera, above the ground-glass screen, a light upright, with a small sight hole, is fixed, the distance of which from the centre of the ground-glass screen being equal to that from the centre of lens to the centre of the perforated screen. If the front of the camera be raised or lowered, the perforated screen is shifted with it. On looking through the sight hole, we see exactly the same setting of the picture as that projected by the lens of the camera, but with the advantage of viewing the subject the right way up. The enclosed sketch fully explains itself. In some cases it is desirable to shade the screen between A and B, but this is not necessary when the camera is placed in a shaded position.

A PLEA FOR THE POOR CHEMIST.

By W. Hampson.

This extremely unfortunate individual has been lashed so often in the pages of The British Journal of Photography, that many will be surprised to find he still lives and dares to lift his head and offer a few remarks in the valuable and ever-welcome Almanac anent his periodical chastisements.

The writer is unlucky enough to be a photographic chemist, but is

fortunate in being an enthusiastic amateur photographer, and these remarks are an attempt to justify chemists in selling photographic material, and a defence, if such were necessary, of that selling.

The extraordinary advance of photography and the rapid increase in the number of amateurs have created a demand for photographic material to an extent that is simply enormous, and, in order to supply this demand, a whole host of dealers have arisen, as if by the wand of a magician, in towns of comparatively small size—towns which have, hitherto, boasted only their one prehistoric 'likeness-taker.'

Most of these newly developed photographic dealers carry on other trades, the selling of photographic requisites itself in these small towns not being sufficient for a living, and among others who have taken up this dealing are to be found many chemists.

One advantage a chemist has is his acquaintance and knowledge, chemically, of the salts used in photography; and another, which by outsiders is dubbed a monopoly, is the fact that he is the only person deputed by the law to sell certain poisonous salts whose use in photography is indispensable.

The sooner this latter fact is recognised and accepted, and the undignified recriminations between chemist and photographic dealers cease, the more it will redound to their good sense. Angry onslaughts denunciatory in their character directed against the Poisons Act and calling for its removal are fatuous, as the consensus of public opinion, voiced by juries, is in favour of additions to that Act, as witness the many recommendations for the placing of carbolic acid on the schedule, and thereby placing restrictions on its sale.

Any one, be he butcher, baker, or candlestick-maker, could begin to-morrow and sell this photographic material, and be thereby designated a photographic dealer, and step into the sacred rights and privileges belonging to that favoured sect; but, if this new fledged dealer follows the calling of chemist and druggist, he is a pirate, a cutter, a filcher of another man's meat; no terms are too hard to fling at him, he has no title to the privileges of a dealer.

This is unjust, or is the calling of chemist a disability to being a photographic dealer?

To cut the matter short, the crux of the question is this, The chemists have incurred the displeasure of the photographic dealers by the Pharmaceutical Society proceeding against them for selling certain poisonous chemicals, and in some cases for the use of the title 'chemist.'

The dealers have retaliated by calling names, which is undignified, and crying for the revocation of the charter of the Pharmaceutical Society, which is worse, for it is a beating of thin air.

The fact that any persons without let or hindrance, examination, or supervision, can commence selling photographic material at any time, in all places and in any quantity should be recognised by these high-and-mighty dealers. The latter possess no proprietary right to be the sole channel for the supply of the photographer. If a demand arises in a town for photographic material, I contend a chemist has as much right as any one to supply it, but no more, and I fail to see why, when a chemist commences in this line, the hands of the dealers should be held up in pious horror, or, in the case of other tradesmen commencing, be extended in welcome.

In these cut-throat times a man sells all he can, and plenty of it, and poaching on other peoples' preserves is a recognised form of competition so long as he *keeps within the law.*

But, Mr. Dealer, a word in your ear, the next time you land a photographically nude enthusiast in your net, who wants fitting out with all the latest weapons in photography, including *Mercury Bichloride*, *present* him with the latter, do not *sell* it. At the moment of writing, the following extract from the *British and Colonial Druggist* in answer to a correspondent meets my eye, and may prove interesting:—

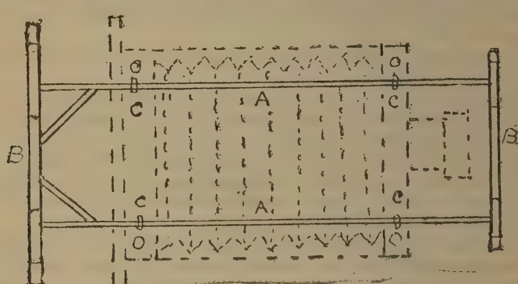
'Privy Council Office, Whitehall, September 15, 1896. Sir,—With reference to your letter of the 10th inst., addressed to the President of the Local Government Board, and forwarded by that department to this office, I am directed by the Lords of the Council to state that the question of imposing some restrictions on the sale of carbolic acid is under the consideration of their lordships.—I am, sir, your obedient servant.'—

J. H. Harrison.'

LENS AND FOCUSSING SHADE FOR THE STUDIO.

By J. A. C. Murray.

We know how important it is that all stray light should be kept from falling on the lens during exposure; also how uncomfortable the ordinary focussing cloth is at times, often giving the operator a most startling appearance on emerging from under it. In the following arrangement neither of these mishaps need occur. I will describe the one I use for a whole-plate studio camera—a light frame, 2 feet 6 in. long by 8½ in. wide. The long pieces are made of ⅜ inch brass-cased tube, the end pieces of cane, the back piece is 14 inches long and the front one 10 inches, and is fastened together with screws, for which purpose the



ends of the tubing are first firmly plugged with wood so as to hold the screws. The longer piece of cane is cemented with shellac as well, and has stays or brackets fastened to the corners to give rigidity. The front piece screws on and off. On the top of the camera four screw eyes are fastened, so as to allow the brass tubes to slide through them, two on the front and two on the back. Having passed the brass tubes through the

screw eyes, screw on the cane for the front of the frame. To this and the other cane the focussing cloth is attached with tapes, flush with the front, and hanging over the back and sides.

When using, pull the frame back, and a most comfortable dark canopy is formed around the focussing screen, giving every facility for examining the image, and need never disarrange one's hair. When the focussing is finished, push the frame forward, and a dark tunnel is formed around the lens, giving the best conditions for exposure.

The cap can be used by putting the hand under the cloth, but I prefer the pneumatic shutter.

BLISTERING AND FRILLING.

By F. Krohn.

These troubles are generally put down to the fact that the gelatine in the emulsion is (from one cause or another) too soft and water-absorbent. It therefore shows a great tendency to swell excessively, and this swelling, as it were, forces the surface and edge of the film off the glass or other support. The remedy for the evil usually recommended, therefore, is the treatment of the gelatine film with an alum solution, so as to harden it and make it less water absorbent.

There is, however, a special kind of blistering and frilling which appears to be due to exactly the opposite cause, and it is to this I now wish to refer. If the gelatine in the photographic film is too hard, it seems to lose its power of adhesion; the result is that, during one of the stages of development, fixing, washing, and particularly aluming, minute pimple-like blisters will begin to appear all over the surface. These gradually increase in size and finally coalesce into larger blisters. When a plate is transferred, say from the fixing bath to the wash water, the rate at which the latter diffuses into the gelatine film must be greater than the rate at which the fixing solution, owing to its greater density, diffuses out of the film. The result is that, for a time, the liquids in the gelatine film are under a state of tension, and there must be a tendency for this tension to relieve itself, and particularly so in the direction of the surface in contact with the support. If, then, owing to the excessive hardness of the gelatine, its adhesion to the support is slight, the tension at this surface will eventually become great enough to loosen it off, and the liquid then begins to accumulate between the support and the gelatine film in the way described. This particular form of blistering is most liable to occur when the plate, film, or paper, is immersed in the alum bath, for then not only is the hardness of the gelatine increased, but the pressure of the liquids in the gelatine is accentuated by the fact that the alum causes the surface of the gelatine to contract; the lower layers of the gelatine film, therefore, get squeezed like a sponge, the liquids in it being forced in the direction of the support.

I have noticed this cause of blistering more frequently in the case of plates and of celluloid films than in the case of paper. Celluloid films very rarely, if ever, show it when fresh; if they have, however, been kept a long time, and especially if they have got somewhat foggy with age, they are liable to exhibit this form of blistering. The following

experiment seems to me strongly to support the correctness of the view given above. The vapour of formaldehyde, it is well known, hardens gelatine. A piece of gelatine which had been treated with formalin (*i.e.*, a solution of formaldehyde), and had been dried, was sandwiched between two photographic plates, so that it was in contact with the sensitive surface of each, After a few days, the plates were exposed, developed, fixed, &c. It was then found that where the sensitive films had been in contact with the formalined gelatine, they had not only developed up less (being less permeable to the developer), but they were also pimpled all over with minute water blisters. No other parts of the plates exhibited this phenomenon, and the result was that the exact shape of the interleaved piece of gelatine could be traced on the sensitive surfaces by this blistering.

R. E. Liesegang describes a somewhat similar experiment in the *Photographisches Archiv* for November, 1895, p. 321 – 325, though his explanation is rather different. A negative was developed with pyro developer, and, when finished and dried, was treated with the well-known cupric sulphate and potassium bromide solution, thus converting the silver in the image into silver bromide. This was fixed out, and the negative was washed. The negative only showed a faint yellow image, due to pyro-oxidation products, formed when the silver bromide was originally reduced in those places. A great many minute blisters now made their appearance in these places where the silver deposit had originally existed, but were absent from the high lights. In other words, the blisters were formed where the gelatine had got hardened through the tanning action of the pyro products above mentioned. Drying the gelatine film had, no doubt, increased this hardening action and diminished its power of adhesion to the glass support. (Note—it is a well-known fact that a gelatine film which has been alumed and then *dried* is less soluble, less water absorbent, after the drying operation than immediately before it.)

Bromide papers occasionally show a tendency to blister from a similar cause, *i.e.*, excessive hardness of the gelatine. The blistering then usually shows itself most severely when the prints are transferred from the hypo bath to the alum bath, and especially where large areas of silver deposits occur.

With plates, films, and papers of the above nature, anything like rough handling must be avoided. The developer and other solutions should not be violently rocked, and should not be too concentrated, and finally, the use of an alum bath should be avoided. If aluming is resorted to, it is best to add the alum to the hypo bath. 'Sulphur toning' will not occur, for the image is composed of silver particles of appreciable size, which are not easily attacked. By the way, as a matter of fact, a good bromide print, sulphur-toned with a hot alum-hypo bath, gives a good sepia image which, under all ordinary conditions, is practically permanent, whereas a sulphur-toned printed-out image is very liable to fade.

The loss of adhesive power of a gelatine through hardening is further illustrated by the fact, that it is difficult to make two gelatine films adhere firmly together if one or both have been excessively hardened, and with transferrotype papers it is frequently possible even to separate the image bearing gelatine film from the soluble gelatine substratum, if

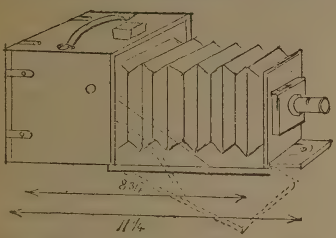
the latter is well hardened by immersing the print in an alum bath before washing it.

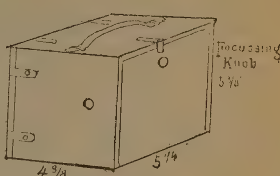
I might note, too, that with thick celluloid negatives the gelatine film, when dry, will strip off the support if the precaution has been omitted to soak the negative in a glycerine-and-water solution (say one in thirty) before drying it.

A USEFUL HAND AND STAND CAMERA.

By Major C. Gardner Vatcher.

I have often wondered why manufacturers have never put something on the market complying with the above heading. I know lots that are sold profess to do so, but, in my opinion, fail in many respects. One I have had built for me by Mr. Lyte, of La Chasse, Jersey, I have used on several of my trips with great success. It is very small, measuring, closed, $5\frac{3}{8} \times 5\frac{1}{4} \times 4\frac{3}{8}$ in. Herewith is a rough sketch of it closed and open. It differs materially from all the cameras I have seen in the following respects : It has double-swing and reversing back, it can be used with a wide-angle lens, it has a rising front, and the Thornton-Pickard is behind the lens. A focal plane shutter can be fitted to it. The focussing knob is under the baseboard. It is quarter-plate, and I use a Wray six-





inch rapid rectilinear and a three-and-a-quarter-inch wide angle. The finder is an Adams' clear view, with revolving wheel for horizontal or vertical pictures. I travel with six double slides. For wide-angle work the baseboard drops and forms an obtuse angle. With the camera body I use another front. Of course, the usual screw fastens it to the tripod stick.

Here is a good formula for those who use Cadett Lightning plates for snap-shots. I use the ten per cent. pyro as given by Bothamley. Label No. 1, bromide of potassium, ten per cent.; No. 2, carbonate of soda, ten per cent.; No. 3, Hauff's metol, 50 grains; water, 10 ounces; sulphite of soda, 1 ounce (dissolve in hot water in order given); No. 4, for snap-shots, use 20 minims No. 1, 30 minims No. 2, 180 minims No. 3, and 30 minims No. 4 to 1 ounce of water for quarter-plate. If they flash up, use more bromide and water. Each mixing does for two plates. Plates of slower speed require less metol. Time is money, and lots of time is wasted in trying to develop a recalcitrant plate, when, with the above formula, all the detail and density requisite can be obtained in three minutes.

A PLEA FOR SPECIALISATION.

By P. Everitt.

An article in the organ of the Vienna Camera Club, which was published a few months ago, impressed me very much with a feeling of regret for the want of enterprise and organization among our English photographic societies. I refer to the project of the Austrian and German Engineers and Architects Associations to publish a work on German Farmhouses. The work is to be illustrated with photographs, and these are to be taken by members of the associations interested. I need not refer to the rules beyond saying they are well considered and practical, and, if the work is carried out on the lines indicated, it should be a most valuable record of the agricultural life of the German-speaking population. Turning to our own country, with its many beautiful farmhouses, what valuable work might be done by the many photographic societies dotted here and there throughout its length and breadth, if only some organization would take the matter seriously in hand. Nor is this the only work of the kind that might be done. Historic buildings, styles of architecture, antiquarian relics, and many other equally important subjects, might be named. Collections of such photographs, if they did not find publishers, might be deposited with public bodies, and thus form a valuable record.

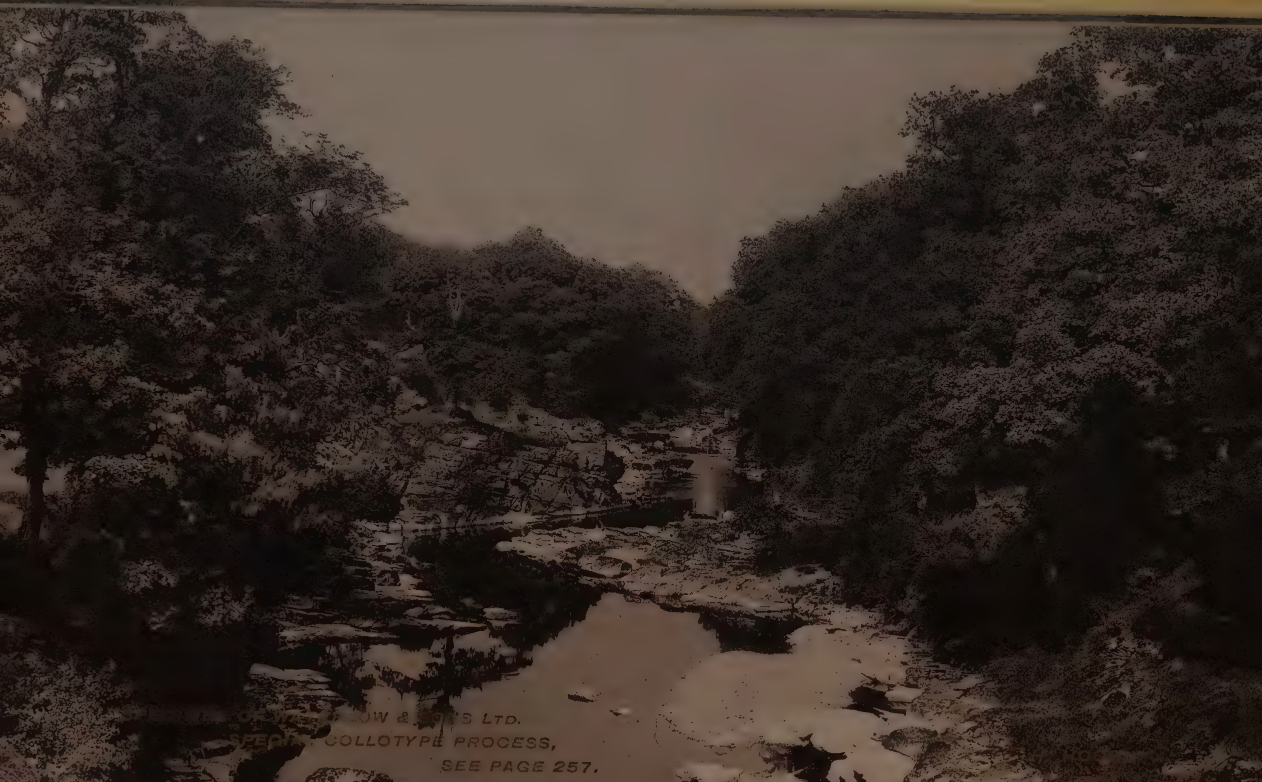
Turning from societies to photographers, using the word in its most comprehensive sense, I would put in a plea for specialisation of work. I recently had the opportunity to see some studies done by a professional photographer in his spare hours. Prompted by a love for animals, he had at odd times made a number of photographs of domestic animals and birds. They were taken on half-plate and subsequently enlarged. Throughout they were characterised with an appreciation of the beautiful, and the power to take infinite pains. I was also shown a number of specimens of work by an amateur, who evidently took great interest in ecclesiastical pictures and decorations. The work was of the highest order, and the copies of pictures would compare with those done by the best publishing firms. If, instead of using plates at random and wasting our opportunities, we would but concentrate our work upon some special object, and aim at giving that object its highest expression, how much greater would be the satisfaction at the close of each season's work.

HOW TO MAKE OPALINES AND BERLIN MEDALLIONS.

By J. H. Smith.

A few brief instructions on the above subject will perhaps be acceptable to its many readers.

First, as to cleaning the glasses into about one gallon of water. Put one ounce of liquid ammonia. Place the glasses into this, one at a time. Well rub them both sides with a sponge. This will free them from any greasy matter. Wash again well in several changes of warm water, when they will be ready to receive the print. Now take one ounce of Nelson's gelatine. Soak it in enough cold water to cover it.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Let it remain till quite soft, when dissolve it in one quart of boiling water Filter through a piece of Chamois leather, when it is ready for use. The solution should be kept in a fluid state by placing the dish containing the gelatine into another dish made of tin, filled with water, and kept hot by means of a small gas jet placed underneath. If gelatine printing-out paper is used, the prints must on no account be alumed before toning, as this would prevent perfect adhesion. But in this case the gelatine both may be omitted, if the combined bath be used for toning and fixing. The print may be placed in the gelatine, but the solution must be only just kept at melting point.

Having now everything ready for use, take the print and place it in the gelatine for a few seconds. Immerse the glass also, and place the print on the glass. Lay on a level table. Place a thin piece of India-rubber on the back of the opaline, and squeegee into optical contact. Now, with a sponge and warm water, take off any waste gelatine, and place in racks or shelves to dry. A very good plan is to cut the print half an inch smaller than the glass all round, and, when dry, take a piece of white paper, the size of the glass, on which is printed the title of the subject, with name and address. Soak this in the gelatine, and squeegee again on the back of the print. When dry, the opaline is ready to be backed up. This is done by brushing thin glue on the opaline back, pressing in contact, putting a piece of cardboard each side of ring to prevent damage when under pressure, and placing one on the other, face down, with heavy weight on the top, till dry; if a black edging is required, with a gold line round, gum the print with a brush about two inches round the outside of the print. Let it dry, and then, with Bates' black varnish, paint round the print and glass where it has been gummed, and let it dry well (the use of the gum round the opaline is to prevent the black varnish penetrating through and spoiling the print).

Now to make the gold line. Get a templet truly cut out of a piece of zinc about half an inch larger than the print when dry on the glass, with rounded corners. Place this on the opaline, and, with the prong of an old fork or a shoemaker's stabbing awl, run carefully round templet, when you will have a fine line drawn round on the black varnish. Now take some Judson's gold paint, and, with a camel's-hair brush, put a thin coating of gold round the line made with the templet, when you will have a fine gold line round the opaline, which is ready for backing up. These instructions apply also to the making of Berlin medallions, the only difference being that the templets of zinc must be made oval or round, as the case may be. If a cream or a coloured border is desired, take some common whiting, mix it with gelatine to the consistency of cream, placing the necessary dye therein. Paint the opaline round with this, giving it a thin but even coating. (This will not require gumming.) When dry, it is ready o have the gold line put round. For opalining, it is best to cut the paper all one way before printing to prevent stretching of the print. Also, the printing should be carried somewhat darker than ordinary. For spotting, take a rather soft retouching pencil, and touch each spot lightly. This will not come off on soaking the print in the gelatine. By following these instructions carefully, with a little practice and patience, nice opalines and Berlin medallions may be made by either professional or amateur.

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SMALL OR LARGE CAMERAS.

By W. M. S.

Although there has been a good deal written from time to time on this matter, I do not think the subject has been exhausted.

I have used 12 × 10 in., 8½ × 6½ in., 4¼ × 3¼ in. cameras, and, after very considerable experience, I am strongly in favour of one taking a medium-sized plate, viz., 8½ × 6½ in. A photograph of these dimensions is a source of satisfaction to the photographer and pleasing to his friends, and this, I think, is the aim of photography. On the other hand, a quarter-plate photograph is too small to be valued by oneself or appreciated by friends.

The advocates of quarter-plate negatives say, Make enlargements or lantern slides. Both these are, no doubt, very effective, but the negative is merely a means to an end, and, if you have to make enlargements and lantern slides to show your work, it seems to me that the end is much more remote than it is when your prints are made direct from a larger negative.

I do not for a moment wish to condemn the quarter-plate camera, because I think it a very useful and convenient little instrument for making a record of holiday or other trips, but for picture-making give me a larger plate, from which I can either make presentable prints direct, or enlargements or lantern slides, when required.

When the question of expense in producing the negative is considered, the quarter-plate has the best of it, a dozen quarter-plates costing 1*s*., while a dozen whole plates costs 4*s*. 3*s*.

PHOTOGRAPHIC LITERATURE.

By C. Welborne Piper.

The appearance of another volume of the Almanac affords a good opportunity of directing attention to a matter the importance of which becomes more evident every year.

Week by week, month by month, and year by year, the photographic world is flooded with literature containing more or less valuable information on every possible matter connected with photography. Miscellaneous articles long and short, lectures on practical work and on theory, records of researches, results of experiments, details of inventions, and papers on scientific matters closely related to photography are showered upon us in profusion almost continuously; and yet a few months after publication it is a matter of the greatest difficulty to lay our hands upon any particular single one, and it is almost impossible at any time to follow the various reseaches of one man, or to compare the particular researches of different men. They are lost in huge piles of journals, the task of searching through which is enough to daunt any individual student; in addition to which they are not confined to the papers which are devoted specially to photography, but are scattered about in various scientific magazines and society transactions and journals.

There is, I believe, an international movement on foot for preparing an index of published scientific papers. It will, however, be a long time before much benefit can be derived from this colossal scheme, and, at the best, it will probably not be of much use to the photographer, for it will have to embrace so many general subjects that the particular ones in which he is interested are not likely to be very minutely dealt with.

Such an index or synopsis, relating only to the matters with which photographers are concerned, would be of inestimable value to all interested in research work, but I think they themselves must undertake the work of compiling it. The labour involved at the first start would, no doubt, be considerable, but, if divided among a number of willing helpers, it would soon be surmounted. The subsequent task of keeping the index up to date would not then be so very alarming. The index itself would, no doubt, be a big affair, rivalling in size the catalogue of a large library; but this would not matter much, as even if only one copy existed, and that could only be consulted at the British Museum, the main object would be gained. There would not, however, be much difficulty in simultaneously preparing duplicate copies, which could be kept at different centres.

Books, as well as articles, would have, of course, to be included, and it would be very necessary to give something more than just the titles, which are frequently very misleading. An indication of the subject-matter of an article, or a brief synopsis of the contents of a book, would be essential. It would also be advisable to indicate, by initials or particular abbreviations, at least one well-known library in which the publication can be consulted. The index should also be arranged so that the student may be able to follow out either the researches of one authority or to compare those of several; that is to say, a subject index and an author's index are both necessary.

The work of collecting the materials for the index would probably be best done by individuals, who would, of course, have to use their discretion in selecting such materials. It is quite possible, however, that a great deal of this work has already been done by private students and librarians, in which case the task of compilation might be considerably lessened.

The compilation of the index could be under the control of a central committee, to whom the individual workers would send in the results of their labours. The form of the index might be based upon that of a library catalogue, the entries being type-written on slips and pasted in large volumes, which should be self-binding, or have interchangeable leaves, so that they could be enlarged and rearranged as necessary. With a sufficient number of helpers, the individual labour should not be great, but the most careful organization would be necessary, and each collector of material should be allotted a particular task. It would be very advisable to start cautiously by arranging for the indexing at first of only a certain number of the most important publications and papers published by some of the most eminent authorities, so that, even if it was found impossible to carry out the scheme in its entirety, still some definite portions of it might be completed. A complete reference index to the published researches of only a few of the leading authorities would be of great value.

Most of the leading photographic weekly journals publish annuals in

which, among other matters, they give a summary of the progress that has been made during the previous year. A valuable addition would be a well-arranged and carefully compiled synopsis of the previous year's volume of their own journal; and, even if this took the place of some of the annual articles, I for one would not mind, as there are now a great many more than I can find time to read. The synopsis, of course, should only include such articles and contributions as are of permanent value, and it would then be of very great assistance to the compilers of the great photographic index, or, in the absence of any such index, to individual students. It would be far easier to take down and refer to several volumes of an annual than to turn out and search through a number of generally unbound numbers of a weekly journal, extending over a period of several years.

To go back to our index, London is the place in which the first great index should be compiled, and I think it is also the place in which the greater part of the material can be found. I have no doubt that the possessors of scientific libraries would afford every facility to the compilers, and so also would publishers, as it would certainly be no disadvantage to these latter to have their publications included in the index.

As regards the compilers and helpers in the work, it seems to me that they ought to be found among the societies, especially among those that have photographic libraries of their own. It is, in any case, evident that the success of the scheme would depend upon the willing co-operation of a number of individuals; and, if this cannot be secured, then the project must fall to the ground, or at the best be very incompletely carried out. Even an incomplete index would, however, be of considerable value, and would provide one stepping stone out of the chaotic muddle in which photographic literature is now plunged.

The British Journal Photographic Almanac has a wide circulation, and possibly some who take the trouble to wade through this article may think with me that the matter is worth consideration, and perhaps that it is worth while to at least make an effort towards the production of such an index.

AN EASY METHOD OF PRODUCING RED PRINTS.

By Richard Penlake.

Every now and again we have, in the columns of our photographic magazines, pictures of a very reddish hue. Not in journals alone are they seen, but in most of the big photographic exhibitions. This colour is considered by some to be extremely unsuitable for certain pictures, and, indeed, so it is; but it cannot be denied, on the other hand, that it is the sole making of others—others indeed which, if printed in a cold tone, would look flat and unimpressive. During the greater part of last winter, I lectured before various clubs on the carbon process, and it was very curious indeed to hear the various opinions expressed when a print on red chalk tissue was developed. Many of the then objectors have confessed to me since that the colour somehow haunted them, and that they had, in some mysterious way, developed a strong liking for that particular tone for suitable pictures. I say suitable pictures, because it would be blind folly to print some pictures in this glaring colour, the selection

must be left to the workers' own discretion. The acknowledged way of producing this tone is by the carbon process, but unfortunately many erroneous ideas exist regarding this beautiful process; many think it difficult, while others think it is expensive; fortunately it is neither, and I only ask sceptics to give it a trial, when they will be at once convinced of its simplicity. For those, however, who do not care to take it up, and still desire this red tone, I recommend an excellent substitute, *i.e.*, matt Solio or P.O.P. Ordinary glazed gelatino-chloride papers are not suitable, but the matted quality when fixed, *without toning*, produces excellent artistic results.

The depth of printing and length of immersion in the fixing bath govern the colour of the finished print. The longer the fixing process the more yellow do the prints become. Prints must, however, be left in the hypo until, when viewed by transmitted light, the mottled appearance has disappeared. I have no hesitation in saying that workers who have the courage to take up this method of producing prints will be delightfully surprised at its simplicity and cheapness. The prints should be printed slightly deeper than they are desired to be when finished. The results, too, I believe are permanent.

SHUTTERS FOR AMATEURS.

By Francis Cobb.

An old-time photographer remarked the other day, 'The more shutters the more bad work.' Without confirming such a statement, one cannot but be amazed at the ingenuity of much of the apparatus, mostly patented, offered to the public at the present day.

I am at this time asked to give an opinion, upon a thing of springs, coils, and wheels, of pulleys and nipples, which is stated to work at from two seconds to the one-thousandth part of a second. Now, the one-thousandth part of a second is pretty quick, and, although in these days of cinematographs and photographing the electric spark it may be theoretically correct to speak of such durations of time, there are other elements that come in there, viz., vibrations, which we cannot discuss here, the more so that the shutter is warranted to work without vibrations. To my mind this shutter has a grave fault, it opens and closes from the centre, somewhat on the principle of the Iris stop. I am told that if one has a space to cover with a piece of metal, then, if one divides that space into ten portions, and set ten pieces of metal to cover a tenth part only, the time required will be only one hundredth part of the time one piece of metal would take. There seems something wrong here. I am further informed that this shutter works upon the principle of 'the eagle's eye.' I don't know much about eagles' eyes. I have seen eagles in many parts of the world, but all the eagles that I have seen appeared to take things very leisurely. Whether eagles can sit round and wink in an infinitesimal space of time, I cannot say. The only authentic case of an eagle winking in my experience occurred in the Sierras Nevadas, where one of our party had a pea rifle, and lodged a pea in an eagle. He knew he hit him, because, as the eagle sailed away, 'he wunk a wink out of pure cussedness.'

Over a quarter of a century ago, Hare made a shutter, which is now before me, as good and in as perfect condition as in the day it was built. A slab of mahogany has cross pieces of the same wood fitted to the ends and dovetailed. Two other pieces, also of mahogany, one wider than the other, are fitted to either side; the outer one being the broader, forms a groove. In this groove is fitted a piece of ebony, which is the actual shutter. This ebony is bound on either side by bands of brass, and these brass binders carry between them a piece of ebonite which, as it is slipped up or down, regulates the time of the exposure. The whole thing is simplicity itself, but the combinations have been well thought out by its maker. Ebony and brass work on mahogany, ebonite works on ebony, and the brass parallels bind the ebonite where set. I look back on early work done with this shutter, and find it hard to beat, although I am the proprietor of six other shutters of wonderful complications. The secret of its excellence seems to be that the openings are straight and parallel, and aperture is lenthened or shortened by the position of the ebonite, but the aperture is always a parallelogram, but of a varying depth. Its action can be slowed by placing it at an angle instead of perpendicular to the plane of the camera, but all this is well known by every one who has used a drop shutter. What is not so well known is how to pull strings, turn springs, fixing revolving scales, and, during these manipulations, have an uncomfortable feeling that somehow the shutter has got back and the film has been exposed most likely on the operator's own face. Simplicity in shutters is a desideratum too much lost sight of at the present time.

THE WATER LENS IN PHOTOGRAPHY.

By J. Vincent Elsden, B.Sc. (Lond.).

Occasion frequently arises in the practice of photography where the use of a large condenser is necessary. Such condensers are not only costly, but also are seldom to be found amongst the ordinary apparatus of the photographic laboratory. The following cheap and very effective substitute may be made by any one possessing only moderate mechanical ability. The idea was, I believe, first suggested by Dr. R. M. Ferguson in a communication to the *Quarterly Journal of Science* for April, 1872; but, as far as I know, its adaptation to photographic requirements has not been so fully examined as its undoubted merits seem to deserve. The following directions will enable readers of the Almanac to construct their own condensing lens of any desired size at a cost of a few shillings.

Let us suppose that a lens of six inches in diameter is required. An oblong pine box, about eighteen inches high and seven inches square, has one side entirely open, and a round hole, six inches in diameter, in one end. This box is placed on end so that the hole is uppermost, and a piece of looking-glass is fastened about midway inside the box at an angle of 45°, and facing the open side. A glass shade of the required dimension (six inches in diameter) is now cut down so as to form a hemispherical glass dish, which is made to rest in the circular hole of the box.

The box is now placed in such a position that a horizontal beam of light can be reflected upwards from the mirror through the glass dish.

The dish is now filled with pure, clean water, free from specks of dust or any solid particles, and a piece of glass is laid over it. Upon this glass may be placed a negative or any other object which is required to be illuminated. With the vertical camera stand, such as is used for photographing objects of natural history, this water lens may be used for enlarging. As regards the illumination, of course direct sunlight reflected by a heliostat is the most powerful; but very good results may be obtained either by artificial light or diffused daylight.

By a slight addition to the above-mentioned apparatus, Professor H. Morton made a powerful optical lantern. His objective was a second water lens, consisting of a watch glass about four inches in diameter, placed directly over the condensing lens on a movable stage, which also carried a mirror to reflect the enlarged image horizontally upon the screen. The performance of such a lantern is surprising, especially when direct sunlight is used as the source of illumination. The chief objection to the water lens consists in the necessity of keeping its surface horizontal, but for many purposes this position is rather advantageous than otherwise.

PHOTO-MICROGRAPHY.

By E. Dockree.

The summer gone, autumn on the wane, winter nearing, some few energetic minds, enthusiastic in the paths of photography, will be sighing for something to do during the long evenings—they are tired of club or society meetings, sick of lantern shows and exhibitions. For the benefit of those who should get into this state of *ennui* I would suggest photo-micrography in the early stage, the more advanced will soon creep on. To many the lengthy word photo-micrography spells expense; such is not the case, far from it. Very little money need be expended, but patience must, the resulting pleasure amply repaying the earnest worker. The fascination of this branch of photographic work is such that only those who have taken it up can realise; it grows and grows on the worker to such an extent that all other branches get forgotten, the "microbes of photo-micrographic fever" holding the worker until dispelled by the appearance once more of out-door work for the camera.

Getting into this state of feeling, I determined to try it, and glad I am that I did so, for, in addition to increasing one's knowledge of the technique of photography, I was able to discern and show to others by means of lantern slides such beauties in nature—insect and vegetable life, &c.—that I had never before imagined existed in this work-a-day world of ours.

Procuring an ordinary table microscope, fitted with coarse and fine adjustments, and the following powers, 2 in., 1 in., ½ in., and ¼ in., I proceeded to see what I could do, notwithstanding the failure prognosticated by a few kind friends, who had not the energy or inclination to try themselves. The first important point to settle is whether the lenses are corrected for photography, or, in other words, do the visual and chemical foci coincide; such must be discovered, soon done by one or two exposures with the completed apparatus I am about to describe. I took an ordinary deep cigar box, cutting a round hole for the insertion

of the tube of the microscope, without the eyepiece (I never use it for this class of work), and at the opposite end of the box I made a square-cornered space, the size of a quarter-plate, for the focussing screen, and in turn the sensitive plate, to rest in.

The best illuminant was a single-wick paraffin lamp, using the ordinary mounted bull's-eye condenser for concentration of illumination (there being no such luxury as a sub-stage condenser fitted to my poor instrument). As a base, to avoid as much vibration (the bugbear of photo-micrography) as possible, I made a block of old periodicals, journals, &c., upon this was placed a board 1 in. thick by 6 in. wide, at one end of which was screwed the cigar box (blacked inside), the rest of the apparatus arranged in line until I obtained an evenly illuminated circle, 2¾ in. in diameter, on the ground glass. Inserting the object, parasite, tongue of insect, or whatever was selected, on the stage of the microscope, focussing as sharp as I could with the coarse adjustment; removing the ground glass, I placed in the space occupied by the same at the end of the cigar box a piece of plate glass scratched in half-inch squares, and, by means of a focussing glass and the fine adjustment, I obtained as sharp an image as possible. Capping the lens and covering up my paraffin lamp, I proceeded to substitute a sensitive plate for the plate glass, protecting from light (extraneous) the whole of that part containing the plate with a thick waterproof cloth, and, having determined on the exposure, uncapped the lens, and let it go (remember the higher the power used the less the illumination, the longer the exposure); after one or two trials, according to the colour of the object, the correct exposure is soon arrived at, using a Thomas's slow plate, or Marion's, and developed with amidol. Some workers say isochromatic plates are absolutely necessary; they may be in high-power work, but not in that such as I have quoted. My results in the form of lantern slides made from the said negatives having always given full satisfaction to the most critical of audiences, the efficacy of my primitive apparatus must speak for itself.

Endeavour, in making lantern slides, to obtain as near as possible the colour thereon of the object itself in nature, and the amplification procured by projection will open the eyes, and the minds also, of the drones to some of the indescribable beauties which they can see for themselves, if not too lazy, besides keeping the photographic enthusiast alive during the winter evenings.

PICRIC ACID.

By Arthur Payne, F.C.S.

Now that the use of picric acid and its salts has become so general in photographic chemistry, it would be well if experimentalists realised their explosive and dangerous character.

Picric acid, also known as carbazotic acid or tri-nitro-phenol, has the formula ($C_6H_2(NO_2)_3OH$), and is produced by the action of nitric acid upon many organic substances, such as phenol, aniline, wool, &c. According to Sanford, one part of phenol (carbolic acid) is added to three parts of strong fuming nitric acid, slightly warmed, and, when the

violence of the reaction has subsided, it is boiled until no more nitrous fumes are evolved. The resinous mass thus produced is boiled with water, and a solution of sodium carbonate added, when sodium picrate is thrown down in crystals.

Picric acid is poisonous, has an intensely bitter taste, and crystallises in yellow shining prisms, is sparingly soluble in cold water, more soluble in hot water and also in alcohol, ether, chloroform, glycerine, benzine, petroleum, &c. The great danger of working with the picrates is owing to their explosive nature, some of which detonate by percussion, and most of them when heated. The acid itself may be burned away in large quantities without an explosion, but the mere contact of certain metallic oxides with it in the presence of heat develops powerful explosives.

It will thus be seen that if the acid is not quite pure, if only a little bit of plaster or lime becomes accidentally mixed with it, it may become highly dangerous.

Other substances, namely, nitrates and chlorates, besides metallic oxides, form very explosive compounds when mixed with this acid, and care must be taken to keep them apart. To give some idea of its powers, Melinite, a substance used by the French Government for filling shells, is supposed to be little else than picric acid, which acid also enters into the composition of many of the smokeless powders.

It was not until after a disastrous accident at Manchester, which led Dr. Dupré and Colonel Majendie to make some experiments, that it was conclusively proved that picric acid was an explosive, and Berthelot has also shown that, under certain conditions, it will explode when heated.

There is no need to go into theory; enough has been said to show that picric acid and its salts are not to be carelessly handled, and, unless the experimentalist has a thorough knowledge of the chemistry of these compounds, they had far better be left alone.

A SUGGESTION AS TO INDEXING PHOTOGRAPHIC JOURNALS.

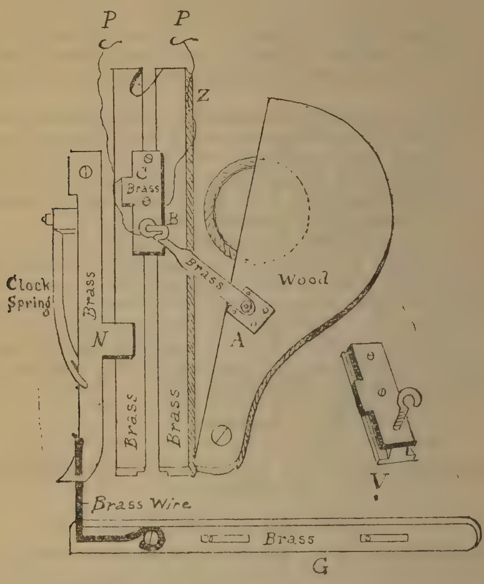
By G. E. Brown, A.I.C.

When one has to search for any particular information through a series of bound volumes of any journal, one begins to realise what a mass of useful information is left unindexed. Take, for instance, the reports of societies' meetings. It must be granted at once that many of these reports consist of uninteresting detail as to chairmen, movers of resolutions, operators of lantern, and the like, which, whatsoever may be their value as news at the time of issue, are so much lumber in a journal to be consulted for photographic information. On the other hand, there are other societies *e.g.*, the leading metropolitan ones, the reports of whose meetings constitute a concise record of useful facts, hints, failures, and difficulties. Unfortunately these reports are rarely indexed, except under the heading of the particular society. Why should not the subject-matter referred to at any society's meeting be indexed with the affix, say, 'S. R.,' for 'society report?' As a model of a good index, no better could be taken than that issued with the year's *Journal of the Society of Chemical Industry*.

AN EASILY MADE HAND-CAMERA SHUTTER.

By George W. Valentine.

The total cost of this shutter when constructed for amusement is only a few pence for sheet brass and a small cigar box of close-grained wood taken from the middle of the tree. The moving arm with joints A and B, should be well made, not tight, otherwise it will not work freely. It is



the most important part of the whole shutter. Under and over each joint should be placed a little washer or a hole bored in a piece of thin sheet brass to act as a washer.

V is an enlarged part showing the construction of C. B and PP are connected together with a thin indiarubber band. To set the shutter, B is connected with a piece of thin catgut which passes out through the bottom of camera. Pull the piece of catgut downwards, which, in so doing, brings T in contact with N, and, in order to set the shutter free or off, press the end of lever G, when up will fly catch T, carrying with it the lever arm, closing the shutter instantaneously to the edge Z. Of course, if required for time exposures, it would be very easy to cut out another catch a little higher up the strip N, or do as I do, hold down the catgut until the time required is up, then let go.

SILVER PRINTING.

By W. E. A. Drinkwater.

The approaching death of silver printing as a commercial process has been announced several times in the short history of photography, but, somehow, we have never got so far as a burial ceremony. Notwithstanding analyses of processes represented at Exhibitions, silver prints are still the stand-by of the professional photographer, whether he practise among the upper ten, or whether he cater for the wants of the vast majority comprised in the upper and lower middle classes.

There is still a charm in a good silver print that none of the newer processes can quite reproduce. Carbon comes nearest to it; but, in professional minds, the highest encomium that can be passed on carbon prints is summed up by saying that such prints 'rival in finish and general excellence the best silver prints.' This is, of course, quite apart from any consideration as to permanence, variety of surface, and range of colours, in all of which carbon far surpasses silver printing. It is merely a commercial way of looking at the capabilities of carbon in producing photographs which the general public shall recognise *as* photographs, and having the peculiar colour which we call a 'rich tone.'

This question of 'tone' has a lot to do with the acceptability or otherwise of a printing process by a commercially minded photographer. He remembers with pleasure the prints turned out in the old days with albumen paper, sensitised at home, and toned to a full, rich purple, and he unconsciously looks for similar results in every fresh brand of paper, or fresh process he may take up. It must be conceded at once that carbon will not do this. The great beauty of a silver print at its best is due to the presence, in slight degree, of double tones. A piece of carbon tissue, on the other hand, is as immutable as the laws of the Medes and Persians with regard to colour. A certain coloured pigment is mixed with the gelatine before we get it, and there the matter ends. Double toning is utterly impossible. There is no desire on my part to run down carbon printing. I regard it as the best means we have at present in which to render our photographs; but I want, if possible, to consider these printing processes from the same point of view—prejudiced point of view, if you like—that the average professional looks at it from. With regard to colour, he sets up the standard of an albumen print at its best, and, if he can get that, combined with the permanence of a carbon or a platinotype and the peculiar surface of a gelatino-chloride, he will be satisfied—for a time.

The surface of a gelatine print has great attraction for a professional. It has greater variety than albumen is capable of. It may be cold-rolled, giving a sort of eggshell finish, burnished to a greater degree than albumen, or it may be squeegeed to a highly polished or dead matt surface. All this without danger of measles, cracking of the albumen, or blisters, but with other disadvantages thrown in. The very surface that makes it acceptable is an awful pitfall; slippery and slimy in use, it is only overcome by the use of alum, which breeds fears for future permanence. Double tones—ah, yes, we started with the idea that a certain amount of double tones were part of the beauty of a good silver print, but not such as gelatine can and does pro-

duce. The almost imperceptible difference in colour between the lighter half-tones and the deep shadows of an albumen print is not to be mentioned in the same breath with the double tones of a gelatine print.

The advent of gelatine paper was a bad day for photography. It put into the hands of careless workers boundless possibilities in the way of crudeness of colour and double and triple tones in the same print, which are supposed to be atoned for by the ease with which enamelled prints can be turned out. That is the outcome, as far as the cheap man is concerned. And what about the better-class photographers? After a great many trials and failures, they find that gelatine is no better in use than albumen. It has its advantages, but also it has drawbacks, and many a professional has gone back to albumen in disgust. Admittedly some have conquered the intricacies of the process, but they can only be regarded as experts in that particular department. Recently I came across a cabinet portrait printed on gelatine that was a treat to look at. The tone was an exceedingly pleasing warm grey, the whites were pure, the burnish good, but not too pronounced, the whole evidently the work of a man who understood thoroughly how to work gelatino-chloride. Inquiry proved that this was so. The man who printed it was, according to my informant, an expert at that particular work, and was paid an expert's salary.

But, nice as this print was, it was not the tone that we old hands hanker for. Perhaps we are wrong to want to go back to the old purples and purple-browns, when we have such a good range of greys open to us with the newer papers; but sticking to the old ways is not necessarily retrogression. There is a large portion of the public who think that a photograph is not a photograph unless it is of the old familiar colour, and we, as business men, must meet the needs of the people. You see, I am looking at the matter from the standpoint of the man who wants to make a living out of photography—a name as well, if he can, but a living primarily.

Again, it is not certain that we shall have to go back to albumen to get what we want. Collodion paper has claims to our notice that should not be overlooked. It is by no means all that we desire yet, but I believe it will in the near future make great strides. A good collodion print can be toned to any colour that can be desired from red chalk, through the browns and purple-browns to an absolute black; also double tones can be obtained on it—offensive double tones, I mean—but not with the fatal facility that gelatine is prone to. Another point in its favour is the economy of gold as compared with gelatine; in this particular it is probably no more expensive in working than is albumen. It has its drawbacks, of course; one is, the liability of the finished prints to become abraded by friction, another is the tendency in some brands to a cracking up of the film. The manufacturers of printing papers will do well to look into these matters, for the firm who puts upon the market a collodio-chloride paper that is easy to work, does not curl or crack, and, if possible, having a little tougher film, will certainly be rewarded with the trade of all the best class of professionals.

As yet, there is, undoubtedly, much to be learned in its manufacture. One sample I have used was excellent in some of these respects: I have never seen a cracked print on it; it burnishes easily and well; the surface does not easily abrade; but—there is the inevitable 'but'—it is

almost impossible to tone it in anything except a combined bath containing lead and citric acid. *That* will not do, we know. Another sample proved just the reverse. It would tone easily and evenly in any separate bath, giving a splendid range of colours, only here the disadvantages cropped up after mounting. Cracked prints formed a large per-centage of the results; the surface, when dry, was easily rubbed up; and in burnishing there formed a peculiar grain, hard to describe, some parts of the print taking an exceedingly good burnish, and other parts refusing to take any. These polished and unpolished parts were so small and so broken up by each other in all directions as to form a perfect grain.

Now, if the excellences of these two brands can be united in one paper (and there seems no reason why they should not be), I for one, should be entirely suited, and I venture to think there are many more who would welcome such a paper. Perhaps our photographic chemists will either put their heads together over this problem, or, as is more likely, will try to outstrip each other in the excellence of their respective productions. In either case good will result to photography and to the professional photographer. Probably the amateur pays best to cater for, but really, Mr. Papermaker, the professional still lives, or tries to live; he *does* use some sort of paper, and his trade might be worth the seeking, if only as an addition to the amateur's custom.

HINTS BRIEF AND PRACTICAL.

By J. W. Leslie Naish.

Dark slides which have only a piece of black card to separate the plates are a source of many failures to those who use them. A metal division should always be used. Divisions with springs riveted on are to be preferred; but a plain piece of zinc, slightly bent in the middle, answers well. This gives a spring to it, and keeps the plates up to the check of the slide—a most important thing if you wish sharp, clear negatives. A piece of cardboard is useless for this purpose. Of course, the zinc must be coated with dead-black varnish.

Vignettes can be printed in sunlight quite as well as in the shade. Simply make a frame, the size of the printing frame you wish to use. This should be about two or three inches deep. Fix a piece of ground glass for the bottom of this frame, and place it over the printing frame, ground glass uppermost.

A dark-room lamp that smokes is not altogether a nuisance. Scrape out the sooty deposit, and save it. This, mixed with a little French polish and still less methylated spirit, makes a really good dead-black varnish for all photographic purposes, except blacking stops.

For blacking stops, immerse them with a pair of pliers in a solution of nitrate of copper, then hold them over a strong Bunsen burner till black. About three immersions and heatings are usually required. Borrow the kitchen black-lead brush to finish them off.

Wash the outsides and bottoms of your dishes as carefully as you do the inside. This will keep your hands clean; and, consequently, you will have unstained prints, &c.

A DELICATE TEST FOR HYPO.

By Arthur Payne, F.C.S.

A solution capable of detecting 1 part of hypo (thiosulphate of sodium $Na_2S_2O_3$) in 40,000 parts of water, or, more accurately, 1 grain of hypo in 92 fluid ounces of water, which is equivalent to 1 in 40,250, is made according to the following formula:—

Potassium hydrate	16 grains.
Potassium permanganate......................	1 grain.
Distilled water	2½ fluid ounces.

This forms a violet-coloured solution, the presence of hypo turning it into a beautiful green.

The best way to use it in testing the wash water that is running from the plates or prints which are being washed after the fixing bath, is to collect a little of it in a test tube, and add a drop or two of this solution, when, if the merest trace of hypo is present, the solution will assume a beautiful green tint. After standing some time, this changes to brown, and afterwards there is precipitated a brown powder, the reaction that takes place being probably that the potassium permanganate $KMnO_4$ is reduced, thereby becoming potassium manganate, K_2MnO_4, a salt which is very unstable, and which, when dissolved in water, forms a green-coloured solution, the hypo at the same time taking some hydrogen and oxygen from the potash, and forming acid sodium sulphate, $NaHSO_4$.

$$8KHO + 8KMnO_4 + Na_2S_2O_3 = 8K_2MnO_4 + 2NaHSO_4 + 3H_2O.$$

The green solution turning brown after standing some time may be accounted for by the fact that potassium manganate is very unstable, and, when dissolved in water, decomposes spontaneously, depositing manganese dioxide, MnO_2, and the green colour changing to purple or reddish violet, owing to the formation of a permanganate.

$$3K_2MnO_4 + 2H_2O = 2KMnO_4 + 4KHO + MnO_2.$$

In my laboratory the solution has kept good for five weeks, but it is most sensitive when freshly made.

A VISIT TO KEW GARDENS.

By J. H. Baldock, F.C.S.

Our worthy Editor having asked me for a contribution to the forthcoming Almanac, I have much pleasure in sending a few *practical* notes, which I trust may be of service to those who contemplate a photographic visit to these charming Gardens, an order having been previously obtained by a written application to the Director. I have been there on five occasions, and, as the negatives, some three or four dozen in number, ranging from quarter to whole-plate, have been very successful, it occurred to me that the results of my experience might possibly be of some assistance to others.

For convenience' sake, I will divide the pictures obtained into four

groups, *i.e.*: 1. The Great Palm House. 2. The Temperate House. 3. The Rock Garden. 4. The Gardens, outside the houses, generally. In Group 1 the plants are so close together, the avenues so narrow, and the light so deceptive, owing to the greenish glass, that it is not altogether an easy matter to get a picture at all; still, such are to be got, and specimens of some of the tropical ferns, palms, &c., form charming subjects, eminently suitable for the optical lantern. On August 17, 1891, I obtained six such pictures, quarter-plate size, using a 5 × 4 Wray lens and Phœnix plates, the exposures being from forty-five seconds to one and two minutes, at *f*-32, according to whether the subject was near the centre or the edge of the house, in which latter case it would have the benefit of a side light. These negatives furnished very good lantern slides, which were shown at the Crystal Palace and elsewhere. The developer used was pyro ammonia (not more than two grains of pyro to the ounce), and tentative development adopted.

In Group 2 an easier state of affairs exists, and the light is much better, but halation, that bugbear of this kind of work, has to be carefully guarded against by the use of Sandell, or backed plates, (I have not tried Oakley's anti-halation plates). In May and June, 1893, and in June, 1896, I secured some quarter-plate, half-plate, and whole-plate negatives in this house, some of individual trees, and, standing in the centre of the house, four views down the cross avenues. The quarter-plate and half-plate were on Phœnix and Britannia plates, and the whole-plate on Sandell II., using the 5 × 4 Wray and *f*-32 for the two former, and a nine-inch Ross and *f*-45 for the Sandell, the exposures being from forty-five seconds to one minute for the quarter-plate and half-plate, and one and a half minutes for the Sandell. The developer was pyro, as in Group 1, except for the Sandell, which was cyclol mixture of hydroquinone, rodinal, and eikonogen).

In Group 3 may be found the elements of a most charming series of pictures, and, though it may be thought that a certain amount of sameness exists in them, yet, out of over a dozen I took there, not any two are at all alike. Of course, it is necessary to select a day free from wind, albeit the garden is fairly well sheltered; and, in my opinion, a bright day, but not direct sunlight, is best suited for the subject, because in all three groups softness and gradation, rather than contrast, should be aimed at, as in all these foliage subjects every vein in every leaf may be seen, and the plants thus easily recognised. In May, 1893, I took some negatives here on Phœnix plates, using a 5 × 4 landscape Wray lens, giving exposures of eight to ten seconds, at *f*-32. These were developed with pyro ammonia, as above. Again, on September 24, 1896, I took some half-plates on Empress films, and these one and all turned out a great success, the lens being the nine-inch Ross, at *f*-32, and the exposure three and four seconds. These were developed with pyro soda, Ilford formula, keeping the pyro low, and adding the soda gradually.

In Group 4 the number of subjects, and their variety, is large enough to please any one, and offers a grand selection. Several pretty pictures may be obtained from the Lake near the river, of the Great Palm House, the Pagoda, &c., and, of course, I secured some of these. The exposures for the Lake were four to five seconds, at *f*-16, on Phœnix plates; those for the Great Palm House and Pagoda ten seconds, at *f*-64 (the height of these structures, and consequent use of the swing back, render the

use of a small stop necessary in order to secure sharpness), on the same plates, earlier in the day. But my special object was to obtain negatives of some of the evergreen trees, magnificent examples of which are so plentiful in these gardens. Thus I secured some fine examples of the *Pinus muricata*, the *Araucaria imbricata*, Scotch and other firs, and cedars. There are a couple of fine cedars near the Pagoda, which I took on a Phœnix plate, giving one and a half minutes at *f*-64 on May 5, 1893. Another cedar on an Empress film, September 24, 1896, three seconds at *f*-16 (windy day). A pine, near the lake, at 2.30 on May 5, 1893, yielded a fine negative on a Phœnix plate, exposure twenty seconds at *f*-64, while a fine Scotch fir at 2.10 on September 24, 1896, exposure three seconds (windy day), on an Empress film, gave a very satisfactory result. A group of 'puzzle monkeys,' *Araucaria imbricata*, were successfully taken at 4.30 on September 24, 1896, exposure eight seconds at *f*-32.

Those who may desire to obtain a negative of the *Victoria regia*, which occupies a house all to itself near the Kew Green entrance, should choose the time when it is in flower. There is only about one spot where it can be focussed tolerably clear of other foliage, and then it is necessary to use a somewhat wide-angle lens, say, five inches on a half-plate. Thus I obtained a capital negative (not, unfortunately, including the flower) on June 25, 1896, giving an exposure of one minute at *f*-45 on a Phœnix plate. Development was carried out with pyro, as already indicated.

And so I might easily multiply examples, but I hope I have given intimation enough to guide those who may be wishing to try some of these really beautiful studies, and possibly to incite others to do so who may not perhaps have hitherto contemplated trying them.

In conclusion, I would impress upon all the value of making notes, which are invaluable for future reference, and without which this communication could not have been written.

THE FINDER.

By James Reuel Smith.

A very elaborate and one of the best recipes extant for cooking a hare, begins with the direction, 'First catch your hare.' Similarly, the best treatise upon hand-camera photography might not inappropriately commence, 'First find your subject.'

Probably only the most indiscreet hand camerist would be willing to state how many of his negatives out of every hundred lack more or less of the object he intended to photograph—lacking them, in most cases, perhaps solely because the finder's image was so small, or the margins of it so blurred that, in the necessary haste of a snap-shot exposure, the position of the object on the plate was largely a matter of guesswork.

Some years ago a writer in The British Journal Photographic Almanac outlined an ingenious contrivance for making the camera lens do double duty, first throwing an image on a finder the size of the plate, and then, the necessary reflector being swung out of range, upon the plate in the ordinary way.

For stationary objects this would give very satisfactory results, but

for objects in motion it would, of course, be valueless at the most critical moment, the moment of exposure.

There are several photographic delusions, and the hand-camera finder is not the least of them. Indeed, many a photographer who would have run away ignominiously from Ajax will not hesitate to aver that his finder has spoilt enough plates to pay for a new camera.

To those whom the dim little piece of innocent-looking ground glass in the corner of the box has not already completely impoverished, it may not be too late to suggest that in ten minutes any hand camera can be supplied with a reliable, accurate finder, usable as an auxiliary to the ordinary makeshift, or, after a little practice, to its entire exclusion.

It is only necessary to place the camera as close to, say, a papered wall, as will admit of focussing the paper's figure sharply. Then, with a broom handle, or any convenient straight-edge stick as a ruler, draw two cross lines on the top of the camera, from front to rear, defining the exact angle of view—and the finder is made for all time.

On a wooden box the point of a penknife can be used, and on a leather box the handle of the knife at the heel of the blade, when it is closed up.

With such a finder one can, by holding the camera steadily against the chest and under the chin, keep his eyes on any moving object, the lines on the camera top showing sharply what part of the view the plate will cover, and, selecting at ease the moment when the lighting and position are at their best, make the exposure, and take an affidavit on the spot as to just what the plate will include when it is developed.

The eye and the lens have seen the object from an almost identical point of view, and the lines have at the same time shown exactly what the plate has covered.

Similar lines drawn on the side of the box will enable the camerist to see the scope of the perpendicular as well as the lateral view.

SOME REFLECTIONS UPON A REFLECTION.

By W. Mathews.

Occupying a seat recently in a newly built carriage on the Great Western Railway, the writer found himself immediately fronting the well-polished door of one of the convenient lavatories that are now an adjunct of some of their long-journey coaches. All the equipments of the compartment were of a superior sort, and were brand-new, and the door of the lavatory was in all the glory of its first varnish. This by way of preface.

Time went by, but the writer had, so far, noted nothing but the spick and spanness of the carriage and the efficiency of the gas light. At length it dawned upon him that the movements which flitted before his eye upon the smooth surface in front of him, and which had been accepted unwittingly as merely the obvious outcome of things, were furnishing material for closer consideration. Placing himself, therefore, so that the well-developed gas light should fall to the best advantage, he at once saw that the flickering patches of light and shadow upon those door-panels were no other than a really well-defined image of himself, and every item

was there in its true and natural proportions, it lacked only the vigour and lubricity of a true mirror.

Soon it had to be noted, however, that its visibility was entirely dependent upon the amount and direction of the light falling upon the sitter. No light, no image; a glare of light, a resplendent 'counterfeit presentment,' yet weird and shadowy withal. And then there came a further consideration, which presently overtopped all others. That correctly outlined face, of a diameter, say, of seven inches, what would happen if, in the camera, it were reduced to but the magnitude of a miniature? Clearly such a portrait, if thus pulled together, would look at least as presentable and well defined as an ordinary process block in an ordinary newspaper. Those, therefore, who care may reasonably turn in this direction to trace the source and origin of those spectral appearances which the credulous have attributed to the presence of spooks and spirits.

But, further, as it relates to the matter of dimensions, practical issues are touched on two sides, for it is a fact that, whilst on the one hand enlargement will so attenuate faintly shown items that they shall vanish into absolute invisibility, diminution, on the other hand, and in specific cases, will bring into view items not before noted at all. In the writer's experience, a portrait which had been magnified into four times its natural proportions showed not the least discernible trace of items which were distinct and unimpeachable when the same portrait was of one-fourth the dimensions of life.

This, therefore, is a consideration which should certainly engage the attention of such photographic investigators as are busy in geological fields, and who are on the look out for examples of the pictorial etchings attributed to primeval man. And, again, there are other learned archæologists who desire to reproduce some presumed inscription found on Oriental rocks. In these diverse instances it has before now turned out to be a point difficult of decision whether the responsible factors of these seeming graphiological vestiges were really the flint chisels of a possible pre-Adamite artist or only the fortuitous attritions of ages of rain drops. Hence the possibly material bearing of the question of dimensions cannot in such cases be safely neglected.

But, to return to the earlier point — the confluence of light — the instance quoted at the outset has not been the only one in which the writer has noted these spectral images upon painted panels. The most favourable condition for detecting them would seem to be when standing in front of a window situated just above the head of the observer. In such case a stream of sunlight will transmute even a mural monument into a temporary mirror.

Not that one would mean really to assert that any object duly illumined would be satisfactorily reflected from the unsophisticated surface of a deal plank; but there are surfaces and surfaces, and there are now also illuminating agencies of surpassing brilliance. It is already an accepted fact that a powerful lantern will throw its picture upon even a rough background of smoke, or cloud, or foliage. So, by parity of reasoning, may a reflected image appear upon a most unlooked-for surface—from a new frying pan to a bank of fog. Hence it follows that when, whether by accident or design, the requisite conditions are present, then the operator may confidently expect that a lifelike spectral figure

will be in weird attendance upon the more legitimate personage of the picture.

One thing, at least, is obvious, there exists the possibility that a line may be drawn somewhere; and the writer desires only tentatively to locate that line, the line dividing between the reflecting capabilities of a brick wall and a well-silvered mirror.

TWO BETTER THAN ONE.

By F. Miall.

In some of the very hot days that we had in the summer now passed I tried various methods, but without success, to obtain some slight relief from the furnace-like heat, so that a coolness might be physically felt; so, thinking that, as mind influences matter, one might obtain some mental pictures of pleasant shade or frost-bound scenes to reflect from mind to matter a cooler sensation, no sooner thought than done, down came a book from the shelves—*Arctic Experiences;* result, somnolency. *Nil desperandum.* The portfolio of winter photographs a failure. Ah, one more effort. The stereoscope and some frost scenes, skaters, hoar-frost-laden trees, and ice-bound nature generally. And, as I looked, the scenes became real and life-like; one seemed to breathe the icy air again, the muscles stiffened; mind triumphed over matter, and I felt cool. Results: Books worse than useless, one-eyed pictures as but nought, and only when one could realise a sensation as it was could an effect be obtained.

Moral:—Take photographs with two eyes, and realise with two eyes things as they are, and don't go about with one eye shut, or rely on one lens to get your best effects.

THE RETOUCHING DESK.

By Henry Erle Cooper.

If one considers for a few moments the large number of retouchers who spend their days, year in and year out, under the canopy of a retouching desk—desks that are often improperly constructed, and more often improperly worked at—I think that it will be admitted that the subject is not altogether unimportant. It will be granted by all that it is no use expecting good work when faulty tools are employed, and, even when the tools are all right, if improperly used, the result cannot be satisfactory.

In the first place, on looking through the dealers' catalogues, I do not hesitate to say there is not a proper desk in the market. The large majority are constructed in a way that is injurious to the health, and renders good work a difficulty. Very few possess side flaps or screens to shut out the side light, which are almost essential. This point is important, but not so important as the tilting of the desk. Most retouchers work with their desk tilted at far too low an angle, so low indeed, that they are compelled to be almost on top of their desk. The result of stooping over their work is undoubtedly injurious to their health, for one cannot sit with chest bent almost double without its having a serious effect, sooner or later, on the constitution. Doubtless the reason that so many

retouchers work in such a manner is that their desk forces them to do so, owing to the inability to prop it up at a higher angle. The remedy is obvious. The desk should be altered so that the front is almost perpendicular. Of course, it must not be quite upright, or it will render the negative unsafe. I consider that an angle of about 85° is best; certainly not less.

The next point that calls for attention is the height of the desk. It should be at such a height that, when the retoucher sits at it, bolt upright, head erect, and shoulders thrown back, the eyes should be level with the opening. I fancy that, if all retouching desks were put to this test, the majority would be condemned. Two elbow rests should also be placed, so that the arms can be conveniently supported during retouching. These add to the comfort, and allow of the negative being handled and turned round during work.

If all the foregoing points are attended to, it will be found that they prevent a good deal of fatigue at the end of the day. They conduce to the production of better work, and prevent a great deal of injury to the health, which is somewhat a feature of retouching to-day.

A PLEA FOR MORE STEREOSCOPIC WORK.

By W. F. Fenton-Jones.

The Editor writes to me to 'distinguish' myself by contributing a little article on the above subject. Why, I hardly know, as I am somewhat a tyro at the art myself. Any way, let it come as from a tyro.

The subject of stereo photography is one that is sadly neglected by all sorts of photographers. Why, is a mystery, as the ordinary layman who takes up one of the latest stereoscopes, and sees the coalescence of the picture before him, invariably exclaims, 'How good! Just like nature.' There, in the different planes, we have the picture rendered as if it were in nature, and we seem to penetrate the scenery in the same way. There is a deal of satisfaction in such productions, and, if all photographers only realised the comparative ease of production, there would be a far greater army of 'double shotters' than there is at present.

We do not require a special camera for such work, as many fondly imagine. Any one who has the ordinary half-plate square bellows camera has practically his stereo camera, and, if he has a twin-lens hand camera, and the lenses are paired, there's his set. The division is a very simple matter to arrange. Again, the half-plate is a positive advantage, in the way that half-plates are to be procured almost anywhere, whilst the ordinary stereoscopic plates are not.

Then, in the after work, the negatives can be enlarged, as in the case of small pictures, and lantern slides can be made with the advantage that, if one of the pictures is faulty, we can fall back on the other.

The stereoscope forms a very desirable article for the drawing-room, as it entertains our friends far more than the ordinary photographs, in consequence of its peculiar advantages over them, and, if we only put the question to our friends, we should find ourselves actually being led by them to take up this particular branch of photography with an ardour far exceeding that of any of our previous work.

FALLACIES IN THREE-COLOUR WORK.

By Walter White.

'For experimenting in three colour process,' says a recent writer, 'three things are absolutely necessary: money, patience, and scientific knowledge.' This is perfectly true; and to these three things might well be added a not too slavish belief in the statements of others. One does not willingly accuse an experimenter of lack of veracity; but, when authorities flatly contradict each other, we may be almost sure that both cannot be correct.

Unfortunately, there still seems to be a general impression that in three-colour printing we are using, or endeavouring to use, the three primary colours as our printing inks. Nothing can well be more misleading.

Hübl has given a most interesting and valuable explanation of the theory involved in this work. Each colour employed for printing should, he says, absorb about one-third of the spectrum, and reflect two-thirds; 'and the best inks are a pure yellow, neither red nor greenish, about a medium chrome yellow or a yellow lake, Milori blue or a blue lake of the same shade, and a bluish eosine or carmine lake.' Clearly such inks, reflecting two-thirds of the spectrum, cannot be primary colours. They are, indeed, secondary colours, and should be chosen to represent as accurately as possible in each case the result obtained by mixing (as light and not, of course, as pigment) the two primary colours that have not been allowed to act upon the sensitive plate. Ives similarly describes these secondary printing colours as yellow, cyan-blue, and pink. Professor Church names these colours yellow, sea-green, and almond-blossom (also called pink, and peach-blossom). Clearly, a study of these authorities points to the necessity of each negative representing the action of only one of the three primary colour-sensations: blue-violet, red, and green.

Strangely enough, F. Bligh Bond, in an article accompanying a chromo-collotype in the *Photographic Quarterly* (July, 1890) misapplies, as it seems to me, the theory of primary-colour sensation by recommending that each colour screen should transmit two primaries and absorb one—in other words, that negatives should be obtained as if for printing in the primaries, violet, green, and red, a compromise being then struck on account of the difference between colour mixture and absorption, and the printing really being done with blue, yellow, and a somewhat orange-red. I am not aware whether any modification has since been made in this method, which, it is only fair to add, has produced excellent results. These, however, appear to be in spite of theory, and may probably be accounted for by the fact that the colour screens or the sensitiveness of the plates used allow, unintentionally, only approximately one of the primary colours to act in each case.

In photochromoscope work, or three-colour lantern projection, each negative taken must represent the action of one colour sensation, the result in natural colours being obtained by the mixture of coloured light passing through three transparencies. It will be seen therefore that, if the theory of printing with secondary colours is correct, such a set of negatives as give correct transparencies for colour mixture will also yield

the most correct results in colour printing or absorption, provided our colours are accurately chosen. This is the opinion of Ives and of Vidal. The latter advises that negatives made for three-colour work should be tested by printing transparencies, which are to be viewed in a photochromoscope. On the other hand, Professor J. Stewart Gibson has recently boldly stated that, in these two methods of colour production, no single negative in one set is duplicated in the other. Perhaps, in this case, the negatives are not correct.

In printing, E. J. Wall commends, for ease in working the process, the adoption of commercial three-colour inks, and the preparation of screens to suit them. If, however, absolute accuracy be desired, accurate negatives must be produced, and the field for experiment in the choice of coloured inks is still open to the investigator. If the three inks cannot correctly reproduce all colours, no manipulation in the matter of screens can ensure correct reproduction.

The question of the colour of screens is an important one; but, in many cases, the instrnctions given on this matter must be of little value, because the colour sensitiveness of the plates employed must be taken into consideration. For example, the red negative (to be printed from in blue) may be made upon a plate that is sensitive to red, yellow, and green, or only to red and yellow. In the former case, a red screen may be necessary to cut off the green rays, while, in the latter case, an orange screen, to cut off the blue and violet, may be all that is required.

Similarly, with the green negative (to print in red), a plate may be used that is insensitive to red. In this case, a green screen is unnecessary, if not incorrect, and a yellow screen may give the best result.

By employing such special plates (commercially obtainable) we may find advantages in the use of orange and yellow screens, in the direction of shorter exposures, and the greater comfort in their development than in that of plates sensitive to too great a length of the spectrum.

In the multitude of counsellors there is not always wisdom so far as colour is concerned. It is often difficult enough to decide between two authorities. What, then, must we think when an authority contradicts himself? I have recently met with the following instructions in a somewhat notable publication: 'For the green negative use an orthochromatic plate which is sensitive to red. Put in the green screen.' 'For the red negative the red screen is inserted, and the plate used must be sensitive to blue.' To what extent the playful printer may be responsible for this hash, it is hard to say.

THREE PRACTICAL WANTS.

By A. Brooker.

It seems to be a generally accepted rule that the man who writes on a subject very often has little *practical* knowledge of, or does not put into practice, the methods or theories which he advances.

In fact, our proverbial philosophy bears this out when we remember that 'empty barrels make the most sound;' but the same philosophy also somewhat relieves our loss of *amour propre* when we also remember that 'there are exceptions to every rule.' With yourself, Mr. Editor, I claim to belong to the exceptions, and, in proof, will endeavour to briefly refer to

three of the most important ('crying,' I think is the correct expression) wants in my actual photographic experience.

The branch of photography in which I am most particularly interested is that of lantern slides and the necessary negatives for their production.

Firstly, I want plates of the highest rapidity, *free from grain.* Subjects of great delicacy, such as rough seas, for which a very rapid plate is an absolute necessity, and cloud effects, are rendered almost impossible for lantern slides by the amount of granulation in the negative film, the final results on the screen presenting more the appearance of copies of lithographs or other crude *artistic* efforts than what should be the more delicate and beautiful results of chemical photography.

Secondly, I want a reducer for negatives having too great contrasts, which shall reduce the denser portions, and not unduly attack the shadows or thinner portions. All reducers I know of, such as ferricyanide of potash, perchloride of iron, &c., are, by contrast, really intensifiers, reducing the high lights slightly, but obliterating altogether the more delicate shadows. The nearest approach to my requirement is toning a negative to a blue colour with gold and sulphocyanide of ammonia, but to do this the negative to be operated upon must be of a warm colour, and one does not want to be always doomed to produce brown-stained negatives.

My third, but not necessarily last, want is a good lime for the lantern. I have tried most commercial brands, and, although some are vastly superior to others, all are wanting, and I think most lanternists will agree that it is of no use further improving the jets, and getting greater candle power, and therefore greater heat, unless considerably more attention is paid to the production of better limes than has been in the past. With a powerful light the lime is almost sure to split, either horizontally or vertically, and sometimes both.

My three wants are very simple, but there is a fortune in the first and good business in the second and third.

FROSTED GLASS PHOTOGRAPHIC MOUNTS.

By Alfred I. Taylor.

These mounts, in certain sizes, may be bought at reasonable prices, but there are perhaps many who would wish one of some particular size and shape, or would like to make them at home, which may be easily done as follows: Cut a piece of paper the exact size and shape of the opening required, fasten it with starch in position on a piece of 18 or 21 ounce sheet glass—if a clear margin is wanted, this portion of the glass must also be protected with paper.

The next thing, is to get the unprotected surface of the glass ground, which any sand-blast works will do for a small charge.

After this, wash the glass with soda water to remove any grease or finger marks, which would prevent the glue sticking to the ground part. The glass will now have a clear opening on a ground surface. To frost it, get some carpenter's glue and paint it moderately thick over the ground

parts, and set the plate aside to dry. When dry, place the plate in the sunshine, or some heated place, for the glue to get bone-dry. In a short time the glue will be seen cracking and curling up in places, the contracting power being so strong that it tears up the surface of the glass.

The glass mount will now have a frosted appearance. They may be further decorated according to taste—flowers painted round the openings, &c., or the back (frosted side) may be covered in silver. I may mention that formulæ for silvering glass have been published for some years in the ALMANAC, so it is not necessary to give one.

THE PHOTOGRAPHIC COPYRIGHT UNION AND ITS ADVANTAGES TO PHOTOGRAPHERS.

By HORATIO NELSON KING.

A VERY old friend of mine, E. L. Sothern (Lord Dundreary, with whom I have played many a part), used to say there were some things 'no fellow can understand!' Well, one of the things I cannot understand is that so few fellows seem to know the advantages gained bp joining the Copyright Union. Attending the last annual meeting at St. James's Hall, I was perfectly astonished to hear from the President that so few provincial photographers take any interest in or join this most useful of all unions—why this apathy? I can only imagine want of knowledge of its advantages to every photographer. Such should not be the case; the photographic press, to which we are largely indebted, has constantly spoken in the highest terms and taken much interest in copyright matters, and frequently replies to questions asked, so one is utterly at a loss to know the reason. Is it that they attach little or no value to their productions? From frequent questions and answers by the photographic press, this does not seem to be the case. In the *Illustrated News* of 1857 is a reproduction of mine, of the planting of the Russian guns in the Victoria Park Bath. In conversation with Mr. Ingram, the founder of the same, when photography had not reached its present position, and very many illustrations were produced from imagination, I well recollect, at that date, few illustrated papers were in existence, saying that the same would be largely increased as photography would undoubtedly do, and that illustrated papers would not then exist without its aid—has that time come? Without doubt. I have frequently had to battle with editors against their argument, 'It is only a photograph.' My reply is, You are quite right, it is a photograph, a true one of the scene represented, not one of those imaginations frequently given by artists of the brush of a scene they know little or nothing of and very little like this 'only a photograph' that is so largely used by illustrated papers.

Times have changed. Process work has largely taken away your ordinary work; then, in return for your labour, process work must pay for your productions. Now, what is the Copyright Union? Solely for the benefit of photographers. Its object is to prevent your work being made use of without payment; the lowest fee you can receive is 10*s*. 6*d*., and I know of cases where 100*l*. has been paid for the right to reproduce.

Now, what are you to do to become a member? Simply agree to its rules! You run no risk, you have no liabilities, you have nothing to pay; if that is not good enough, I don't know what is. Register your photograph, if you think it is of any value, and. I may say, you never know what may turn up. Now, some will say, If I let a paper have my photograph, my name and advertisement of the same will bring grist to the mill for copies ordered. You never will make a greater mistake. My experience in this line for over forty years—and let me say I have always been paid, and never could see the advantages imagined by many—well, I have had hundreds of my works copied, and I can only trace one instance of supplying copies through such illustrations, viz., two copies of a cabinet portrait; and this, I am sure, is the experience of most who have had their work so used. Well, you will say, Nothing to pay! how does the Union carry on its work? In this way: By voluntary subscriptions and a percentage on penalties (they have a good reserve fund and a good balance at bankers'). If you win, so much the better for you. The Solicitor to the Union is one who thoroughly knows the Copyright Act in all its bearings. One thing I wish to impress on photographers, the President and members of the Council are good business, practical men, whose knowledge of the work they have undertaken does not date from yesterday. They receive no fee or reward for their labours.

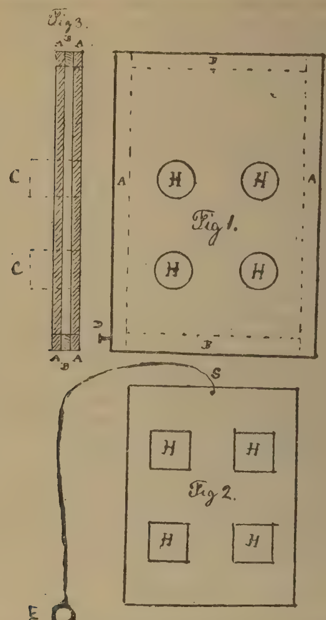
My experience of the Union is this: I joined at the commencement, and very shortly after, thanks to the President's advice, through their solicitor I received heavy damages for infringement, and the cost to me not one penny. Now, the future of the Union rests with professional photographers, and amateurs will not regret joining the same. I note with great pleasure that three provincial photographers have been added to the Council; this, I feel sure, will add largely to the increase of members, and to their benefit. I would make one suggestion: That the chairman or president of every society throughout the kingdom should bring under its members' notice the advantages obtained. The Secretary, Mr. Gower, Photographic Copyright Union, Chamber of Commerce, Botolph House, Eastcheap, will, I am sure, be only too pleased to forward particulars, and answer any questions; remember the cost, 'nothing.' Well, now, my earnest advice to every photographer who sets any value on his productions is, Hurry up, join the Union, give it your hearty support, the benefit will be yours. The one who does not must be a ———; you will excuse the blank, the reader can fill this in as he pleases.

HOW TO MAKE A SIMPLE SHUTTER SUITABLE FOR ORDINARY, STEREOSCOPIC, OR VICTORIA CAMERAS.

By J. T. Hackett.

For several years I have observed that the shutters usually supplied with Victoria cameras (which are generally fitted with four lenses), are very defective, because, owing to their construction, they always give two of the four pictures a much longer exposure than the other two. The shutters usually supplied with the above cameras consist of a slab of wood, that is either worked as a flap shutter or is slid from side to

side of the camera front, or is raised up and let down. In either case, two out of the four pictures are always more exposed than the other two, and, all being on one plate, it is impossible, or at least very difficult, to dodge all four in development, so that they shall be of the same density. These difficulties led me to design the shutter about to be described, which, whenever the lenses are separated from each other by a distance equal to or slightly exceeding their diameter, this form of shutter is the best that can be employed, because it always uncovers, or covers (as the case may be), all the lenses at the same instant. I now describe a shutter suitable for a Victoria camera with four lenses. Procure some cigar boxes, or other thin wood, and proceed as follows:—



Description of the Illustrations.—Fig. 1 shows the back of the shutter box; A, A, and B, B, are narrow pieces of wood screwed and glued to the back of the shutter box. These pieces must be slightly thicker than the wood, or other material of which the shutter (fig. 2) is made, so as to allow the latter to slide up and down freely within the space shown by the dotted lines in fig. 1. H, H, H, H (fig. 1) show the holes through which the lenses look. The front of the shutter box is made exactly like the back of the shutter box, except that no strips of wood are fastened to it. The front of the shutter box is fastened to the pieces

A, A, B, B, in fig. 1 by the aid of screws only, *it is not glued as well*, because it is best to be able to remove it easily, in case the string breaks that the shutter is worked by. The shutter (fig. 2) is, of course, carefully fitted and placed into position before the front of the shutter box is screwed on. The string that the shutter (fig. 2) is raised and lowered by may be either passed through a hole in the top, back, or side of the shutter box, as may be thought best by the operator, I prefer the side myself. If the hole through which the string passes is bushed with a brass eyelet hole, same as used in leather lace-up boots, the string will work very much more smoothly than it otherwise would do, and will also last longer. The brass eyelet holes are very cheap, almost any boot-maker sells them. I bought about twenty-five for one halfpenny, and a friend of mine bought two for a penny in the same neighbourhood, but not of the same man; so their price varies a little, you see.

Fig. 2 shows the Shutter.—It is made either of thin wood or sheet metal—I prefer metal, and recommend zinc, because it is thinner than wood, and it is also easily cut with a pair of shears and a carpenter's chisel, the chisel being used with a straight-edge in a similar manner to that of ruling lines with a black-lead pencil, the motion being frequently repeated with more or less pressure until the metal is cut about half way through, it is then easily broken off. The squares, H, H, H, H, would be cut out thus: A hole is punched with a fine bradawl, in each corner of the squares, and the chisel and straight-edge worked from hole to hole in the same way as above described. This is done on both sides of the metal, so that it is cut half way through from each side. The openings are then made smooth with a fine file, and the shutter is complete, a small hole near (S fig. 2) being made through the shutter, and a string fastened to it, by which it is drawn up and let down.

Fig. 3 is the Section of the Shutter Box and almost explains itself. A, A, shows the back and front of the shutter box, and B, B, shows the strips of wood, A, A, B, B, in fig. 1, forming the narrow box in which the shutter (fig. 2) works. C, C (fig. 3) shows the blocks that fit the lens hoods. If the hoods can be removed, so much the better, as then only thin blocks will be necessary, and the back of the shutter box can be fastened by the aid of four screws to the front of the camera, and all chance of its shifting during use will be done away with. It will be seen from the foregoing description that the shutter is worked in front of the lenses; but, if it could be fitted behind the lenses, it will be hidden from the sitter, and it will also act in a much more efficient manner; because the foreground would then always receive a little longer exposure than any other part of the picture, no matter how short or long the total exposure may have been. This is, as every photographer knows, advantageous in at least nine exposures out of every ten. The foregoing can be done, in some cases, in the following manner: The lenses are removed from the camera front, and the shutter box (without the blocks C. C.) is screwed to the camera front, the lenses are then screwed to the front of the shutter box, and the thing is done. Whenever possible, I advise the latter arrangement to be employed in preference to the former.

The Shutter is not designed for shorter exposures than half a second, although, with practice, a more rapid exposure than this can be given. It is, however, well suited for giving exposures from half a second to any longer period desired.

The Shutter is worked in the following manner:—When the string is let go, the shutter falls to the bottom of the shutter box, and opens all the lenses at exactly the same instant, and they will remain open until the shutter is pulled up to the shutter box by the aid of the string. The string has a small brass ring fastened to it as shown at E (fig. 2.) Before and after exposure this ring, E, is slipped over screw, D, in fig. 1, which keeps the shutter up and the lenses covered. When everything is ready for exposure the ring, E (fig. 2), is carefully taken off the screw, D, (fig. 1), and held firmly between the finger and thumb, so as to keep the shutter up and the lenses covered, until the exposure is to be effected. Then gradually, but quickly, lower the shutter, *don't let go the ring and thus cause the shutter to fall suddenly*, as it may, and probably will, make noise enough to make a baby or animal start, just at the most critical moment, and thus spoil the plate, and perhaps also all chance of obtaining as good a picture as would have been otherwise possible. The holes, H, H, H, H, must not exceed in size the diameter of the lenses (but may be a little smaller if possible), because it will not be possible to have them larger, as a rule, when four or more lenses are to be uncovered, and covered at the same instant, because there will not be space enough between each lens to allow the opaque part of the shutter to cover the lenses thoroughly before and after exposure. *When using the above form of shutter for one lens only, or two stereoscopic lenses, on a square camera*, there may be space enough between the lens and the bottom of the camera front to work the shutter upside down, *i.e.*, in such a manner that, when the shutter is at the bottom of the shutter box, the lens or lenses are closed, and, when the string is pulled and the shutter is drawn up to the top of the shutter box, the hole or holes (as the case may be) in the shutter will pass across the lens or lenses, and cover them again. By this arrangement very rapid exposures could be given. *In order to be able to do the above, the lens or lenses used must not exceed about one inch in diameter*, and the shutter box must measure exactly the same inside, from the bottom edge of the lens to the bottom of the shutter box, and from the top edge of the lens to the top of the shutter box. In other words, the depth of the shutter box from top to bottom must not be less than six times the diameter of the largest lens, that is to be employed with the shutter, the lens being mounted exactly midway between the top and bottom of the shutter box. The great advantages of fitting the shutter behind the lens have already been referred to.

DARK-ROOM ILLUMINATION.

By H. G. Moberly, F.R.P.S.

Why do some photographers work in such darkness? A friend who had given up photography lately handed over to me a gas burner with ruby chimney, light-tight cap, &c., as supplied by a well-known dealer for dark-room use. I had hitherto used a paraffin oil lamp, and I looked forward to saving myself the trouble and mess of trimming and refilling, but great was my disappointment. The result was darkness just made visible. My old oil lamp, with a much lighter ruby chimney, but with a

screen of ruby fabric half way round at about two inches from the glass on the side turned towards the developing dish, gives four or five times as much (diffused) light on that side, and much more (direct) light on the other; yet I have not had a single case of fogging, although I have been using Edwards's snap-shot isochromatic films, which are as sensitive to red light as any plates made; but I always cover the dish when developing, except when it is necessary to examine progress, and that is the secret of working in a comfortable light.

Why, again, are travelling lamps made to burn oil or else whole candles? The first is messy and apt to leak, while with the second, you are liable to finish your candle just at the critical moment in developing or changing. A better plan is to use ordinary candle grease in a small open tin, with an arrangement in the middle to hold a wax match, to serve as a wick. The supply can be kept up by adding bits of candle grease, which the heat soon melts down, and, when you have done, the whole solidifies in a few minutes ready for next time. A still better plan (which has been provisionally protected) is to keep up the supply on the bird-fountain principle, the receptacle for candle grease having an air-tight screw cap or cork for filling, and being so placed that when in use the heat melts the contents, and allows the grease to flow out as wanted. Such a lamp might contain fuel enough for several weeks; and, in any case, candle grease is obtainable everywhere.

ON BLISTERS IN CARBON PRINTING.

By James Brown.

Perhaps the following hints may be of service to those who have been troubled with blisters in the development of carbon prints on rough-surface single transfer papers. My own experiences in this line have been particularly trying, but since adopting the following procedure, which is the result of suggestions received from various sources, I have not had a single blister, and the process, even with the roughest papers, has become as certain as with the smoothest:—

1. Soak paper for five minutes in water at a temperature of about 65° Fahr.
2. Soak in a weak chrome alum bath for five minutes.
3. Lay paper on a sheet of clean glass face downwards and squeegee with sufficient force to expel all surface liquid, and with it the air (which being imprisoned in the pores of the paper gives rise to blisters).
4. Soak again in water from ten to thirty minutes according to thickness of paper.
5. Soak tissue until it curls up at the edges if for transfer to very rough paper, but only until it lies flat if the transfer paper is of finer grain.
6. Squeegee vigorously so as to force tissue into the hollows of the paper and put under pressure for thirty minutes.
7. When about to strip the back off tissue, don't use force, but let it soak in water at 100° to 110° Fahr. until the back comes off quite easily.
8. If found necessary to increase temperature of water in developing, let it be done gradually.

A FEW NOTES FOR EVERY-DAY WORK.

By Harold Baker.

When the days are shortening fast and winter is almost upon us, the Editor's request comes, asking for something for the annual—a request which cannot, and ought not to be neglected. Perhaps a few practical notes will be acceptable.

Fixing Bath.

For some years I have adopted the practice of adding chrome alum to the fixing bath. Some plate-makers tell us not to be tempted to add anything, but never to omit a separate alum bath; but my experience shows that the combined fixing bath has many advantages, and, as far as I can discover, no disadvantages. In the first place it dispenses with the operation of aluming and washing, and it saves room, as no second dish is needed; and this is important in many dark rooms in towns, where space is scarce and costly.

I have had several plates spoilt by curious markings when using a separate alum bath, and there is always the danger of precipitation of sulphur in the film, from insufficient removal of the alum before the plates reach the hypo solution. The gelatine film is so thoroughly hardened in the combined bath, that it dries in a much shorter time, and can be dried at a higher temperature without danger of melting. Some of the more rapid plates are prepared with a gelatine so soft that it produces little 'pits' or transparent spots, if the operation of drying is much prolonged, especially in warm damp weather, and after excessive washing; this is quite prevented by the use of the combined fixing bath, unless the washing and drying have been very much prolonged.

At first I prepared the bath by pouring hot water over the dry alum and hypo; but this produces a dense yellow precipitate, which is inconvenient.

A better plan is to tie a coarse muslin bag over the mouth of a large earthenware jug, so that it hangs down inside the jug for six inches; into this bag place the hypo and about one eighth its bulk of sulphite of soda, pour hot water upon the crystals until the jug is nearly full, and so that the muslin bag is partly covered with water; when the hypo and sulphite of soda are dissolved, put into the bag a quantity of chrome alum equal to the sulphite; when the latter is dissolved, the bath will be dark green in colour, and almost free from precipitate. It can be poured out of the jug through the muslin and used until exhausted, preferably in a grooved porcelain tank. After washing, the film should be gently rubbed with a piece of soft chamois leather.

Washing after Fixing.

The duration of washing after fixing is an important point, upon which there is great difference of opinion. Some are not satisfied with less than twelve hours. A safe average is, I think, about an hour. I was much impressed by a remark of (I believe) Professor Bothamley, that a plate would wash as quickly as it would fix. It is perhaps best to err on the safe side and give a little longer. In a grooved tank, with a stream of water passing out *at the bottom*, all soluble matter must be removed in an hour, and any longer washing must be harmful to the gelatine, unless the plate was well hardened before washing.

The result of insufficient washing may not be discovered for some months. One of my friends, a very careful worker, never washes his negatives longer than fifteen minutes. I must confess this seems to me scarcely long enough. It is the habit of many photographers, who ought to know better, to print their negatives without varnishing, especially when printing in platinum. They forget that the paper contains ferric oxalate, which is a powerful reducer used in conjunction with hypo, and an insufficiently washed negative is very liable to absorb moisture, in wet weather; it then takes up ferric oxalate from the paper, and reduces the negative in patches.

Protection of the Film.

If a negative is worth keeping, it is worth varnishing, and the new celluloid varnish 'supplies a long felt want.' It is usually sent out much too thick to be either economical or convenient, as it takes so long to drain and dry. I usually thin it with acetone and methylated spirit; if too much spirit is used, the varnish becomes lumpy or 'ropey;' but a little more acetone or amyl acetate will put it right. The celluloid varnish is so waterproof that the negative may be left in water for an hour without affecting it, and even hot water makes little impression on the gelatine. I have all my negatives varnished with celluloid before retouching, and with shellac afterwards. This seems perhaps unnecessary, but the professional photographer never knows how valuable any one of his negatives may become, and all reasonable means should be adopted to preserve them. In the first week I tried this plan I had a stack of new negatives of interiors rained upon, and found several days later they had water between them. If they had been varnished with shellac, they would all have been spoilt, but, thanks to celluloid, they were quite unhurt. This varnish must not be used over retouching, as it washes all the medium and work off. The only objection to it is its dreadful smell, which will penetrate into every room in a building in a few minutes.

HIGH-PRESSURE WATER SUPPLY.

By Alexander Mackie.

It is a great convenience at times to be able to command a full and strong current of water, but for ordinary purposes a quiet and steady stream is more useful, especially in the developing room. There, a tap from which issues a current which ranges from the assertive impetuosity of that from a squirt to the tumultuous raging of a mountain torrent, according to its volume, is a most provoking thing to deal with. To fill a measure glass to a definite mark direct from the tap is almost impossible, to attempt to wash a negative under such a stream is to court its destruction, and, if the negative has a tendency to frill, only the most philosophical individual dare run the risk, not only to the negative, but to his happiness, when negatives and all things sublunary will be things of the past.

The most obvious remedy is to tie a piece of some material, flannel in preference, over the mouth of the tap; but this, I find, is not an entirely satisfactory proceeding. I have recently discovered a much simpler and more efficacious method of overcoming the difficulty. It is so simple

that I have not the slightest doubt that others have adopted the same plan before me; but, as I have never seen it applied, I imagine that it may be a novelty to some.

Take a piece of rag (any material will do), about eight or nine inches long and about five inches wide, and wrap it lengthways round the tap to form a sort of flexible tube. This tube offers very little resistance, indeed, if the rag is wetted first, it need not be tied on the tap, but it is sufficient to check the impetuosity of the stream, and the flow becomes even and steady. From its nature, there is no danger of it injuring the negative or the measure glass, and, as the method involves so little trouble it is, at least, worth trying.

SQUEEGEEING.

By C. H. Crosby (Chicago).

In spite of all that has been said against the 'glossy finish,' and the superior claims, from an artistic point of view, of prints on the various forms of matt paper and its kindred varieties, the fact remains that, for certain kinds and sizes of prints, the highly glazed surface is most desirable.

While we recognise the claims of our artistic contemporaries fully, the purpose of this paper is merely to point out to the ordinary amateur a means of avoiding certain difficulties and mishaps attending the production of glazed finished prints. We have very carefully tried the directions for the use of plate glass with its attendant trouble of polishing with talc, &c., and have had the usual percentage of mishaps and disappointments.

This paper would probably not have been written except for the reason that we overheard quite recently an amateur stating his difficulties in this connexion to an attendant in a photographic supply house, when we were struck with the lack of information on the subject.

There is nothing more simple or more certain in its results than 'squeegeeing' if properly taken in hand, and the percentage of failure is not probably one print in one hundred. The first requisite is a proper ferrotype plate, it being in all respects better than glass. Much that is sold is unfit for the purpose. The plates are thinly coated, the surface rough and irregular, and sometimes full of small pits or blisters. Such plates cannot, by any possibility, yield a satisfactory result, as every defect on the plate will be reproduced on the print. The proper plate is one having a rich, deep, velvety surface, absolutely smooth. Premising this much, the process is as follows: Wash the plate in hot water, rubbing with the fingers, carefully removing every particle of dust, water marks, &c.; polish same with some old soft rags, or use the 'Selvyt cloth, which is very desirable. This requires but a few seconds, and avoids the messiness of French chalk, &c. When ready for use, slip the plate in the washing water, and, after removing the print to and fro a few times to remove air bubbles, float it upon the plate (face down, of course), and remove plate and print from the water together. If the print slides a little, hold it in place for a moment, when it will settle. Next take a piece of clean unprinted paper of a proper size, and place upon the back

CHATSWORTH HOUSE.

of the print, and then, with a flat squeegee, press out the excess of water. This prevents not only the moving of the print on the plate, but also prevents roughening the fibre of the paper. Put away, if possible, in a draught of air, but this is not absolutely necessary. When thoroughly dry, but not before, slip a thin-bladed knife under one corner, and the print will strip from the plate perfectly with a beautiful gloss.

It must be borne in mind that any article of dirt on the plate, remains of old emulsions from other prints, or any dampness, will prevent the prints stripping as desired. If it is desired to mount them, cut a piece of paper one eighth of an inch smaller on each side than the print, and lay the same in the middle of the back of the print. Use any suitable paste, and brush over this paper so as to form a paste edge on the print. They can then be smoothly mounted without loss of the gloss. The writer claims no originality for the process, having learned it from a very successful worker, and sends it to the ALMANAC merely in the hope that it may smooth the path of some struggling amateur.

ONE SIZE—SMALL SIZE.

By REV. B. HOLLAND.

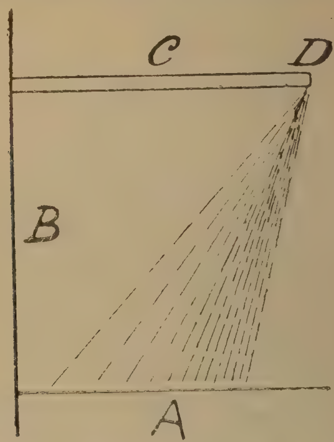
THIS short article will scarcely concern professional photographers, but may be profitably read by amateurs and beginners, not because of its literary value, but because the hints given are the outcome of lengthened experience. Men in business must be prepared to do business by supplying the picture customers require, whether it be a *carte-de-visite* or 12×10 in. print, and this means apparatus suitable for the work. But how many cameras have accumulated in lumber rooms which only see the light occasionally, or not at all. Ambition has said to their owners, 'Get this size, and that size, and, if possible, every size, for the bigger the work the better it will be.' The result, too often, has been failure in all sizes and any amount of disappointment. Far wiser is it to stick to one, and that a medium or small size. In this way one gets perfectly familiar with the tools employed and very quickly learns to use them to the best advantage. For occasional workers, moreover, a small camera will be a greater convenience than even the popular half-plate, and, if a square plate is used in it instead of an oblong, especially for hand work, it will be ready for almost anything that turns up. This I have learned from working on the centre only of a quarter-plate, the pictures so taken averaging about 3×2 in. These are most suitable both for the lantern and enlarging, and might be obtained, either vertical or horizontal, equally as well on, say, a $3\frac{1}{2}$ in. square. Such style of work also can be done with short-focus lenses, and we all know how much more brilliantly these work than those of long focus. The question of economy, again, is thus easily met, for neither for plates, dishes, nor chemicals, will the outlay be large. If the young aspirants for medals and prizes will bear all this in mind, I believe they will sooner reach that degree of excellence in technical and artistic qualities which will gain their pictures a place side by side with the best and greatest.

H H

SHADING.

By J. S. TEAPE.

ALTHOUGH printing is generally considered to be a very simple part of necessary photographic operations, no doubt many will agree with me in saying that this simplicity vanishes when some effect is required which is different to that given by the simple print from the negative. There are various reasons for what I may call dodging the negative. Most of my readers will have met with many cases where parts of a negative have had to be protected during the printing. There may be a gradual decrease of light from one side to the other, so that, by the time you get your print of the right depth on the dense side, the other is quite a blank of one deep shade, with little or no detail. Small portions which require much more printing than the surrounding parts are best managed in the old way by an opening in opaque paper. But the rectification of small spots is not



the part of the subject I desire to treat now. It is the protection of larger masses in such a way that we shall produce in them such a gradation as the printer may desire. Of course, the method is one of shading the negative during printing.

But how shall we get a short or long scale of gradation as the case may require? This is the question which bothered me some time ago; for I found that by the usual way of protecting by pieces of cardboard, &c., required very close attention, or the print would be spoiled, and, as a rule, a critical eye would detect the imperfect character of the gradation. The mode which I have adopted is this:—

In a position shaded from the direct sunlight, procure a space, A, which may be the ground, a table, or fixed shelf placed against a wall or board, B, a board, C, eighteen inches wide, and any length over three feet to suit the requirements of the printer, may be fixed to the wall, B, at eighteen

inches above A, or arrangement can be made to move it into different positions nearer to A. It will be seen by the diagram that the light passing the edge of the board at D will decrease as we pass under C towards B. The nearer we approach C, the shorter will be the gradation given.

When it is required to give any particular form or line, cardboard may be cut and fixed by drawing pins to the edge of board, C, at D. With this arrangement, if a printing frame of whole-plate size, with plain glass and sensitised paper in it, is placed at six inches from C, and one short edge level with the edge of C at D, you will get a beautiful gradation from one end to the other, from dark to white. This may vary a bit according to the intensity of the light. The tender gradation obtained will, I think, surprise a great many. The above experiment will give some idea of what can be done by this means.

THE VARIABLE DEVELOPING POWER OF COMMERCIAL PYROGALLOL.

By H. J. Channon.

A fact has recently been noticed which is of serious importance to the photographic experimenter, viz., that different samples of pyrogallol vary very greatly in their developing power. Mr. James Cadett first drew attention to this matter at a meeting of the Photographic Club in April last, where he stated that with some makes of pyrogallol he found he got higher speed results than with others, and Mr. Bridge has since announced that he too has noted great differences in the action of different samples. Now, these statements were of much interest to me, as I had, in the course of some experiments made for the Watkins' Developing Competition, also had experiences which led me to believe that this variability existed, and, in fact, I had even given expression to that opinion in some notes which were sent up with my specimens in the autumn. Some of the pyro developers which I used were so proportioned as to act very slowly, and, therefore, any differences which might exist in their developing powers were naturally easily to be detected. Happening to use different samples of pyrogallol in mixing some of these developers, which were applied in experiments where the composition of the developers and *all other conditions* were otherwise identical, it soon became quite clear that very great alterations in activity of development had resulted from thus changing the pyro, and only by a large increase in the proportion of alkali in some cases, as compared with others, could similarity of developing action be obtained. As these observations of mine have agreed so well with those of others, there can be little doubt as to the existence of this uncertainty in the action of commercial pyrogallol, and it is therefore evident that, where standard developers are being settled for speed-testing or other purposes, we have here a possible source of error which must be taken into consideration.

Some little difficulty and disappointment has already arisen from this cause in an experiment which I have undertaken, and a short account of the matter may perhaps be suggestive. About two years ago I exposed a number of plates under practically identical conditions, intending to

develop them at intervals spread over a long period in order to note the effect of keeping. For purposes of comparison, I developed some plates at the time of exposure, keeping an accurate record of the proportions of the ingredients of the developer used (pyro ammonia), the temperature of the solution, and time of development. I was also careful to exactly test the strength of the ammonia employed, and then thought I should be in a position to reproduce the same conditions of development at any future time, never suspecting that the developing power of the pyrogallol was a variable quantity. As it turns out, therefore, I shall not be able to compare the negatives developed at different stages with any feeling of confidence that such differences as may be found are due to the effect of keeping only. My experiment will, in consequence, be so much the less valuable or instructive than it might otherwise have been.

No doubt, absolutely pure pyrogallol would be invariable in its developing action. It has, however, been generally understood that the ordinary commercial article was so nearly pure as to be fit for use for experimental purposes, and it may be useful to caution photographers that the supposed uniformity of action of this article must not be too readily taken for granted.

'PHOTOGRAPHIC ECZEMA.'

By J. Pike.

Some months ago I wrote in the Journal some little account of my personal experiences of the havoc, to say the least, made of my finger ends by the unguarded use of modern photographic chemicals.

That trouble was so acute at the time that it necessitated practically a cessation of all photographic work *ex camerâ*. The use of finger stalls and gloves was indispensable if any work was done, any device, in fact, which would make actual contact impossible; but work under such conditions is not congenial to one accustomed to a very different procedure, and, finally, I had to put aside all photographic labour for at least six months.

There has been some little gratification in the fact that, from time to time, *other* workers have, apparently to their great surprise, awakened to the fact that, by some means or other, their finger ends have become sore, the skin peeled, and an unsightliness produced almost worse than the discomfort. How our professional brethren go on I cannot conceive, for it is impossible to think they can all be impervious to the ravages made by certain deleterious fluids.

There was nothing at all in the wet-plate days to be feared, so far as I remember, from the use of bath and developer of those early days. One's fingers might be hard and black, but they never developed such a state of painful exfoliation as is liable at any time to attack the operator of to-day.

I cannot call to mind any ill effects from working for some years, intermittently, the *carbon* process. The bichromate solution never harassed my cuticle.

There is nothing harmful in the continued use of our old friend 'pyro;' the finger ends get stained—badly stained—but there the matter ends, as far as my experience goes. The more pyro we use, the more leathery becomes the skin.

The trouble has appeared simultaneously with the more modern and potent developers—solutions which, no doubt, show their effect least of all if the physical condition of the worker be at its best, practically certain to appear if the general health falls below par.

I am sorry to say I cannot name any remedy which will unfailingly 'touch the spot,' or, in other words, effect a ready cure. Each individual must, in a measure, 'work out his own salvation' in this matter. The use of finger-stalls, plate-lifters, clips, gloves, &c., is suggested at discretion; liberal washing with a good super-fatted soap and warm water, followed by the application of *pure* lanoline (not the *cream*, which is not nearly so tenacious). Attention to the general health, and sometimes an entire rest from all work beyond the 'camera' stage is indispensable to complete recovery. Now and then it suffices to go back to pyro and ammonia, and the albumen-paper days, with its simpler formulæ; but it is generally safer to strike work for the time being.

DAYLIGHT SPOOLS.

By Hector Maclean, F.G.S., F.R.P.S., &c.

Perhaps nothing connected with hand cameras has been more noticeably prominent during the past season than the increasing favour which has been bestowed upon the rollable film. Several inexpensive and portable hand cameras, fitted with spools, have been lately well pushed by manufacturers; hence, no doubt, many reading these lines will be glad of a few words relating the experience and deductions of one who has tested most of the more popular makes of the above type of hand camera.

Personally, I approached the question as to the efficiency of the rollable film with considerable prejudice against it, both on theoretical and upon practical grounds. I was, therefore, agreeably surprised to find that, in some respects, the film produced negatives which were all that could be wished A brief exposure was ample for the production of pictures possessing good detail and gradation; and this without any forcing, using an ordinary pyro-ammonia developer. So far, I had nothing to complain of, and was much pleased with a number of snap-shots of cattle, horses, locomotives (moving), river scenes, &c., which I secured, quite eighty per cent. of those attempted turning out useful memoranda. More than this I could not claim for them; for, apart from the poverty of the lenses, fitted to the particular cameras, which I was able to test, the negatives, without exception, possessed certain technical blemishes which would ruin them, were they to be regarded from the standpoint of photographic exhibition works.

To commence with, the films all showed fine horizontal lines, which are said to be due to the mechanical devices used for winding and unwinding the spools. Again, some of the negatives were damaged by one of the numerals printed upon the backing having, somehow, made an impression upon the sensitive film. Further trouble was found in the appearance of dark spots, varying in size from a pin's point to a large pin's head, which appeared during development; not, I opine, through any inherent radical defect of the film, but consequent upon difficulty of

manipulation. I also experienced some trouble in always cutting off the exact portion belonging to a particular exposure, and also found that there was a liability for some portions of a film to be twice exposed, other portions remaining unexposed. The above was limited to strips not exceeding a quarter of an inch in width.

The chief objection is due to the trouble and uncertainty which attend development, washing, and fixing, that is, where the ordinary dishes are used, and the ordinary procedure is followed. In such a case, no reliability can be placed upon getting a desired, and possible, result. In any case, using all special devices for getting the best results, the rollable film is far less amenable to treatment directed to obtaining a wished-for effect than is a glass plate, and so, for the highest class of work, it cannot, in its present form, be profitably employed. For all which, the great portability and instant availability of the new spools, which can be changed at a moment's notice in broad daylight, must needs commend the type of camera under consideration to the average man who uses photography at odd moments, and for all kinds of purposes, except the highest class of picture-making.

Two improvements suggest themselves to me in connexion with these 'daylight spools.' First, that, instead of the minimum number of exposures per spool being twelve, it should be reduced to six. The great bugbear of celluloid film is the deterioration due to atmospheric action. Hence, unless this last risk is faced, the photographer must either use up his spool quickly, which often will mean wasting half his material upon worthless subjects, or else undergo the tedious and somewhat uncertain operation of cutting off, in the dark room, part of the roll, thus ensuring that the earlier exposures are not ruined, but still risking that the later ones are injuriously affected.

It is in my experience rare that even a hand cameraist finds more than six worthy subjects a day. Any how, with the facility of changing spools in the open, one can easily, using six exposures to each spool, carry enough for three or four dozen pictures in his pocket.

The second suggestion is that the daylight spool should be made available for all cameras, and not confined to those for which it was originally designed. With all 'ordinary' people the cardinal desire in photographic pleasure or work is to escape the dark room ; even the enthusiast who 'from egg to apple' accepts no aid often longs to be able to change plates when miles away from the ruby lamp. Any how, with the growing disposition on the part of the public to delegate all technical work to paid specialists, there is sure to arise a strong demand for these convenient daylight changing spools, especially when experience and ingenuity have combined to overcome certain mechanical and chemical defects, some of which I have touched upon, which are at present apt to be noticeable in rollable films.

DEAD BLACK STAIN FOR CAMERAS.

By Procella.

In the construction of a large copying camera it was necessary to have portions of the woodwork stained with a dead black. A solution of pyro and sulphate of iron was tried, but this required to be applied many times

before anything like the necessary depth of tint could be got. Another solution was made with different quantities of the pyro and iron. This solution was made in the same jug, but when it was applied to the wood a brush was used which had a quantity of bichromate of potash adhering to the bristles. The effect was astonishing. Instead of numerous applications required when pyro and iron alone were used, one rub with the bichromate brush gave a deep dead black. Since then solutions have been made up with varying quantities, but something like the following seems to give good results :—

Pyro	½ ounce.
Sulphate of iron	½ ,,
Bichromate	½ ,,
Water	4 ounces.

If too much bichromate is used, the resulting colour has a red tinge.

It is not known whether this mixture has been used before or not. If it has been used before, no harm can be done by directing attention to it again.

The stain has two qualities to recommend it—the rapidity of the result, and the fact that the chemicals used are in the possession of every photographer.

A PLEA FOR READY-SENSITISED ALBUMEN PAPER.

By John Brown.

In spite of the popularity of gelatino-chloride and collodion papers, judging from the many new ready-sensitised papers recently put on the market, there is still a good demand for albumen paper.

And, while most of the cheaper-class photographers favour the glossy papers, it is noticeable that a good many of the high-class firms still stick to their old friend albumen. This would seem to prove that sitters with cultivated taste prefer the less glossy but softer printing paper. I do not think so many professional photographers sensitise their own paper as formerly. No doubt, with perfect negatives, home-sensitised, if printed under favourable conditions, will give the best results, but perfect negatives are not always obtainable, and there is no doubt that it is easier to make negatives suitable for ready-sensitised paper, and that with this paper more even results can be obtained. During dull weather, when the printing of a single copy from a negative frequently takes the best part of the day, it is not an easy matter to get even tones with home-prepared paper. The prints usually appear to be toned before they are put in the toning bath. And in many other ways the working of albumen paper sensitised at home is affected by the weather, more than paper purchased ready prepared.

There is considerable saving of time and waste with ready-sensitised. The printing frames can be filled in over night, and a start made first thing in the morning, when we usually get the best light, the printer is not confined to a certain quantity of paper which might have been prepared in the morning ; should there be a quick light, full advantage can be taken of it, and, should the day turn out wet, there is no waste through too much paper having been floated.

Some brands of ready-sensitised paper certainly blister rather badly,

but, though the guarantees given in advertisements are not to be relied on, there are good papers on the market that are practically free from this trouble.

Many receipts have been published for preventing blistering, but the only infallible remedy is methylated spirits. Immerse the prints previous to the washing before toning; care must be taken that the whole of the print is properly soaked, as the spirit seems to facilitate toning, and, if the print has not been properly immersed, the toning will be unequal.

To sum up, while gelatine paper is very useful for some classes of work, and with home-sensitised paper good results can be obtained from good negatives under suitable conditions, ready-sensitised paper is the best for all-round portrait work.

TABLE OF EQUIVALENCE FOR USE IN THE PREPARATION OF STOCK DEVELOPERS.

By Matthew Wilson.

Equivalent of Ammonium Bromide in Grains.	Weight of Bromide in Formula in Grains.	Equivalent of Potassium Bromide in Grains.	Equivalent of Ammonium Bromide in Grains.	Weight of Bromide in Formula in Grains.	Equivalent of Potassium Bromide in Grains.
·04	·05	·06	24·68	30·00	36·45
·08	·10	·12	32·91	40·00	48·61
·16	·20	·24	41·14	50·00	60·76
·20	·25	·30	49·37	60·00 (*a*)	72·91
·24	·30	·36	57·59	70·00	85·07
·32	·40	·48	65·82	80·00	97·22
·41	·50	·60	74·05	90·00	109·37
·49	·60	·72	82·28	100·00	121·53
·57	·70	·85	89·99	109·37 (*e*)	132·91
·61	·75	·91	98·74	120·00 (*b*)	145·83
·65	·80	·97	164·56	200·00	243·06
·74	·90	1·09	179·99	218·75 (*f*)	265·84
·82	1·00	1·21	197·48	240·00 (*c*)	291·67
1·64	2·00	2·43	246·85	300·00	364·59
2·46	3·00	3·64	329·13	400·00	486·12
3·29	4·00	4·86	359·99	437·50 (*g*)	531·69
4·11	5·00	6·07	394·96	480·00 (*d*)	583·34
4·93	6·00	7·29	411·41	500·00	607·65
5·75	7·00	8·50	493·70	600·00	729·18
6·58	8·00	9·72	575·98	700·00	850·71
7·40	9·00	10·93	658·27	800·00	972·24
8·22	10·00	12·15	740·55	900·00	1093·77
16·45	20·00	24·30	822·83	1000·00	1215·30

(*a*) = 1 drachm, apothecaries' weight; (*b*) = ·25 ounce, apothecaries' weight; (*c*) = ·5 ounce, apothecaries' weight; (*d*) = 1 ounce, apothecaries' weight; (*e*) = ·25 ounce, avoirdupois weight; (*f*) = ·5 ounce, avoirdupois weight; (*g*) = 1 ounce avoirdupois weight.

Rules for Use.

This table is constructed for the purpose of showing what weight of ammonium bromide is equivalent (as regards bromine) to a given weight of potassium bromide, or *vice versâ*.

The central or formula column gives the number of grains of either bromine present in the formula which the photographer is using. Should this weight represent potassium bromide, and it be desired to substitute for it its equivalent in ammonium bromide, the said equivalent will be found in the left-hand column, opposite the formula weight in question. If the formula weight should represent ammonium bromide, its equivalent in potassium bromide is to be similarly sought fn the right-hand column.

When the weight is not a round number, the proper fractional parts must be added together, *e.g.*, What weight of ammonium bromide is equivalent to 16¾ grains of potassium bromide?

Pot. Brom.		Ammon. Brom.	
10·00	=	8·22	
6·00	=	4·93	
·75	=	·61	
16·75	=	13·76	Answer, 13·76 grains.

THE FUTURE OF 'PICTORIAL' PHOTOGRAPHY.

By Day-after-to-morrow.

A leisured class, with competencies or incompetencies, ever seeks new sensations, and their vainer part would ever be an 'amateur' of something.

Photography was a fine field for these drones, and they soon rushed in to fill it.

Certain illiterate tradesmen, who had tried art, but failed, began to pose as 'artist-photographers,' and to write the merest drivel upon art. Then followed a host of amateurs, who with a camera could easily produce (by fluke, as a rule) a 'pictorial' transcript of nature, and they, too, joined the babble and finally embalmed themselves for ever in a ridiculous brotherhood of children, called the '*Linked Ring*'—the latest sickly flower of a morbid body.

From these morbid children, let us turn to the professional artist; for in his doings we can read the future.

Name after name occurs of painters who were once photographers, and who have now discarded the camera in their fuller wisdom, whilst some of the more acute never used it. Others, however, still use it as *an aid* to their own damnation.

In a publication of this class, it would be useless and invidious to give the names of the men of ability amongst the younger painters who look upon the use of photography as sapping the natural power of the artist, but to the initiated their names are known, and in their condemnation of the use of photography for artistic purposes lies the death warrant of so-called pictorial photography.

Amongst amateurs, the tendency will be to small hand-camera (such as the guinea Kodak) work, and finally to renunciation when their vanities shall have been appeased or their sensations sated; indeed, the bicycle has already killed thousands of amateur photographers, and to the good of the nation.

And photography will finally take its place as a *recording* trade, and a *reproducing* business in its lower branches, and as a *science* in its higher branches; and to talk of art in connexion with it will be as childish as it now is to talk of 'plastic force' or the 'philosopher's stone.'

QUERIES AND QUERISTS.

By F. H. Burton.

A careful perusal of the column devoted to Answers to Correspondents in The British Journal of Photography suggests the following hints with a view to overcome the great diffidence shown by many inquirers who are evidently about to commence operations in the 'black art.'

In the first place, do not go to a respectable dealer for your outfit; he would probably spend half a day trying to make you understand the proper use of each separate appliance, and that would indicate an expectation on his part to receive a reasonable profit on the sale of his goods. Just get a supply of post cards and borrow a back number of The British Journal of Photography, from which you can get the address of the Editors. Then, as a start, ask them to state in the next issue who makes the best lens, camera, &c.; also, as a protection for yourself, who makes the worst. Don't stay to consider this is rather invidious; you must not think at all, or you will spoil the whole business. Just demand a reply that will offend as many of their regular advertisers as possible. Then don't buy the next issue of the paper, but wait a month or so until you come across a copy in the nearest free library, and, if your questions are not answered in that particular number, send another post card to the Editors and demand an explanation. If they point out your questions were dealt with a fortnight back, let them know at once you did not see that number, and request them to re-insert. If they decline to do so, you may conclude they know nothing about apparatus, and are rather afraid your superior intelligence will make this evident. You therefore decide to rely on your own judgment, and buy an outfit at an auction of pawnbrokers' old pledges, or some similar source, for about as many shillings as those rascally London makers ask pounds. You are naturally well pleased with your great bargain. The camera has all the warranted movements, and a few more besides given in gratis. The lens will probably be much superior to anything made in recent years, but has no name on the mounts. You will therefore send another post card to the Editors, asking them to say who it is made by, and also its probable value, which you are assured must be a large sum. If they say they don't know, never mind, it only shows you were right in suspecting their ignorance in the first instance.

You commence operations by making portraits of your family and friends. Your part of the work will be perfect, lighting and pose are all

nonsense, but everything will be spoiled by the wretched quality of Snookes' plates. You write to Snookes and tell him so, demanding your money back for all the plates you have used. Snookes does not see it, and you write another post card to the Editors, asking them to let the public know what a fraud Snookes is. The Editors tamely say the make of plate referred to is one of the highest quality, which they often use themselves with excellent results. The meanness of this is exasperating, as they avoid mentioning Snookes by name, and thus rob you of the power of spoiling his trade. You decide to plod on unaided, and at last secure a portrait of the maid-of-all-work, which that young woman thinks is 'bootiful;' but, oh, horrors! when Sarah Jane takes the print out of her box to show it to her young man, it has gone yellow in patches. This is not your fault, it is that swindling dealer who has cheated you in the quality of that quarter of a pound of hypo he sold you for a penny. You send another post card to the Editors, giving your private opinion of that dealer and asking them to state the exact amount of pure hypo necessary to fix a cabinet print. They reply they have just published a long and exhaustive article on the subject by two experienced workers, and that they do not advise any one to use the exact amount of hypo necessary to remove the unacted-upon salts of silver, but leave a good margin so as to be safe, hypo being a very cheap article, economy in its use not being advisable. This, of course, puts your back up, and you write another post card to say there is nothing mean about you, will a stone of hypo in a gallon of water fix a quarter-plate print, demanding an immediate answer under threat of withdrawing that two pence per week which you don't pay for the paper. The Editors in despair laconically say Yes, and you are happy ever after.

Moral: Editors have nothing on earth to do, and exist solely for the purpose of making elementary experiments, which you could determine for yourself at less cost than the price of a post card. They ought to know everything, and be able to give satisfactory explanations of every possible mishap without troubling their correspondents to give any data upon which to base a conclusion; and, finally, they ought never to expect their subscribers, whether real or bogus, to read the various articles upon which so much thought and study have been expended.

SENTIMENT IN TONING.

By J. A. Randall.

A famous photographer on being asked, 'How do you mix your developer?' replied, 'With brains, sir, and plenty of 'em!' Another, not equally famous, of whom I inquired, 'How do you tone your prints?' answered, 'With sentiment, my boy!'

At the time I considered the reply an evasion of the question, but have since learned its meaning, and discovered that, in the seemingly mechanical process of toning, a large amount of sentiment can be displayed. What is more, it is just this sentiment that makes the difference between toning and a mere change of colour. The photographer I have mentioned was one of the old school, and worked mainly in albumen, yet

within these narrow limits he possessed a complete range of tones, each of which was connected in his mind with a certain class of picture. Thus, in his scheme, all subjects of a religious or semi-religious character were toned of a grey or blue, leaving them of sober appearance. He not only gave churches this tone, but also the portraits of clergymen and others engaged in the more serious occupations. Animals he invariably toned a warm brown, thus giving the pictures a warmth and vitality which suggested life, whereas, if toned a blue, they would seem cold and lifeless. Between these extremes he had many tones, related by all kinds of subtle ties of sentiment to different subjects, toning being, to him, little short of an art.

With the increasing number of processes for printing in monochrome, the choice of a tone becomes still more a matter in which sentiment can be shown. The variety being greater, the selection can be the more extensively applied. Sea views might be printed in the half-tone blue process, sunsets in one or the other of the numerous processes for red tones, churches and buildings in the cold tones of platinotype, and landscapes in sepia or brown. To print sunsets in blue, or churches in a fiery red being unpleasantly suggestive; a grey morning or similar effects being also out of place in brown, a cold tone being more in agreement with the sentiment of the subject.

To many an experienced man such toning, with sentiment, may seem a refinement which practice will not admit, and of no commercial value. With that opinion I will leave them; but will request the attention of all those just entering upon their photographic career, pointing out that it is precisely such small matters that make the difference between a photography which is mechanical and a photography which is artistic. Apart from any commercial consideration—although I believe that all artistic work will command a better price than the mechanical—my opinion is worth consideration, as it provides a means of raising the photographer from a mechanical drudge to a worker having an intelligent and artistic delight in his work. To show how the mechanical may degrade a man, I will end by describing the method of one who toned without sentiment. His method was to mix the toning bath in a large dish, and proceed to put a small batch of prints into one corner, he next did the same with the remaining corners. By the time this was done, and without looking at a single print, the batch in the first corner was removed and replaced by a fresh one. The other corners were visited in like manner, the operation being repeated until all the prints were 'toned.' My old friend, 'Sentiment, my boy!' would have called this 'changing the colour,' and I quite agree with him. A comparison of the prints turned out by the two workers would have demonstrated to all the superiority of sentiment above the mechanical.

NOTES ON PHOTOGRAPHIC MOUNTS.

By Rev. T. Perkins.

The way in which a photograph is mounted is by no means a matter of indifference. Of course, the shape, size, nature, surface, and colour of the card to which the finished print is attached cannot really alter the artistic value of the picture, but may set the picture off to advantage, or,

on the other hand, may kill its tones and distract the eye from its beauties. Popular taste is not a safe guide to follow. One still sees albums intended for photographs with the openings surrounded with a coloured floral border or other pictorial decoration, and I suppose there are people who admire this kind of thing, or such albums would not be made; but a moment's consideration will show that this form of mounting is wrong in principle. The border attracts the attention of the eye, and the picture becomes subordinate to it; but it is not against such monstrosities as these that I wish to enter a protest now, for I hope that taste is sufficiently educated as a rule to condemn this special form of false decoration, nor need I do more than make a passing allusion to the similar error of hanging drapery round the frames of pictures, as is sometimes done, for it must be manifest to any one that the colour of the drapery will, in many cases, kill the colour or tones of the picture, and, in any case, the drapery will break the outline of the frame that is intended to form a rigid line of demarcation between the picture and its surroundings; it is against the use of the fashionable plate-sunk India tint mount that I wish to protest on the present occasion. That these are fashionable may be seen from the advertisements of dealers and photo-print sellers, and the fact that, while plate-sunk mounts can be bought anywhere, I have often had considerable trouble in obtaining mounts with a central oblong pasted down upon a larger sheet of a different colour. The printed India tint is a sham, a mere imitation of what is right and natural enough in a proof engraving; the plate sunk mark, in like manner, is a sham, and, moreover, it has no beauty in itself, but is only a necessary result of a certain manner of printing from metal plates; but that is no reason for imitating it artificially in a photographic mount. It is quite true that a narrow band round the print of a different colour from the mount often sets off a picture. Such a band of white or pale cream round a platinotype, mounted on a grey mount, is often very effective; but the best way of setting to work is to buy a plain grey mount, and to prepare the white border to the print, of such size, width, and shape as will best suit each individual picture.

The purchase of mounts, with any lines or markings upon them, naturally leads to the trimming of prints to fit these borders, whereas each print should be trimmed in accordance with the subject, and the mount and frame (if any) made to suit the trimmed print. My own practice is this: One print is made the same size as the negative, and is then trimmed to the most effective size—and, if any more prints are wanted, the paper is cut approximately to this size before printing—the fine trimming being reserved until the print is dry. After this, I proceed to mount it. I first decide how wide a margin of light colour will look best, and cut a rectangular piece of thin white or cream-coloured paper so that it may show the required margin; and then I paste this down on the grey mount with starch, and, as soon as it has been rolled down flat, I paste the print on it, and let all dry together. The mount may, if necessary, be subsequently trimmed. When it can be done, a good result may be obtained by masking the negative, and so forming the white border of the printing paper itself; but this method is not convenient, unless the print (white border included) does not exceed the size of the negative, as the mask should be fixed to the negative; and, if it exceeds the size of the glass, it will be impossible to keep the negative in

a grooved box; and, whatever method of storing is adopted, the mask is liable to be torn. When, however, the print, with its border, does not exceed the size of the negative, pieces of black lantern-slide binding strips, wetted and stuck on the film side, form capital marks, as the length and height may be reduced independently of each other, and any rectangular form desired given to the picture.

HOW TO MAKE ARTIFICIAL CLOUDS.

By E. Dunmore.

Once again our old favourite year-book of condensed information is, I am reminded by the Editor, in course of preparation, and to which I am requested to contribute something. What that something shall be is rather difficult to determine, as almost everything about photography has been written and rewritten an unconscionable number of times. Novelty is, of course, out of the question. I will therefore say a word or two about a matter that does not seem to improve so much in proportion to other photographic advances as it ought to do, and that is, the treatment of the sky portion of the picture. Thousands of photographs are printed without a vestige of cloud, when a judicious bit of it would make all the difference between an interesting and uninteresting subject.

But 'clouds are so troublesome to take' is a frequent excuse for the blank space. Nothing of the kind. On the contrary, they are quite easy to photograph when the opportunity occurs. Still, as the chances of doing them may be rare with many, an artificial substitute may be easily extemporised, and pass with the majority as real, and be no offence to the artist mind. It goes without saying that the maker of a cloud negative must be possessed of some little artistic ability, but the majority of photographers have that. This, then, is the plan: Procure some sheets of clear, colourless celluloid; make one surface matt by rubbing with pumice stone in fine powder, or by other means. Talc may be used in place of celluloid for small work. Any way, you make a thin transparent support that can be worked on with pencil and stump, and lay it on a retouching desk or its equivalent. Get a cake of best black lead, and crush a little down into a fine powder. This is all the material required. Now lightly sketch in the form of the clouds required on the matt surface. With a little practice the sketching may be dispensed with, and the stump may be brought into use at the beginning of the work, as the forms even of the best-defined clouds must be soft at the edges. It must not be forgotten that the drawing is to be in reverse, like a negative, a condition that at first is rather difficult to grasp, but once got accustomed to it, and it becomes quite easy. A good plan is to have a real cloud negative for a copy, and practise making others like it. When a certain amount of proficiency is attained, go to nature itself.

These artificial clouds can be printed from on either side, and sometimes the interposition of a thin sheet of glass between the cloud negative and the print to which it is to be added will improve the result. The printing is precisely the same as with real clouds, except that the artificial

ones may be thinner and print more rapidly, of course requiring a very subdued light to get the best effects, and a little sunning down afterwards to improve and further harmonise the result, which should then be indistinguishable from real clouds.

A PROTEST.

By Chapman Jones.

I should like to take this opportunity of protesting against two methods of work which have of late been strongly urged upon photographers, namely, to select a printing method that will best suit the negative, and to prefer artistic excellence to permanency where both are not attainable. These methods are not only unnecessary, but evil in many ways. They encourage laziness and incompetence in the photographer, and are likely to lead to dissatisfaction, if not fraud. To give such advice to the photographer is equivalent to saying to the builder, Make a fine house, but do not bother about the foundations, and see that the appearance of its parts is harmonious, whether or not the materials used will change colour or decay in a year or two. It is like saying to the sculptor, If you can find a material more easy to work in than stone, use it for your finest works, whether or not it crumbles to dust in a few months; and to the tailor, Appearance is everything, and by all means use shoddy, if only it looks all right when first made; never mind the wear. The tendency of the age is towards bad work that looks good; but public teachers who have any self-respect or desire to really benefit their fellows ought to fight against this tendency, and not pander to it.

It is not necessary to select a printing process to suit the negative, because it is possible to make the negative to suit the printing process. The negative is truly said to be a means to an end. To adapt the end to the means is a method that carries its own condemnation on the face of it. As to the preference of artistic excellence to permanence, this also is unnecessary, because the two are not incompatible; but suppose that, in a few cases, they would not go together, then, as the work cannot be done well, it had better not be done at all. It should be noted that this is not a question of art or no art, or even of photographs or no photographs, but merely a matter of a few photographs more or less.

The permanency that I advocate is not that of the pyramids, but merely an ordinarily honest degree of permanency, such, for example, as that of dyed fabrics a generation or so ago, before people were willing to sacrifice everything to colour and shade, and when manfacturers would not dare to risk their reputation by introducing a dye of doubtful lasting qualities—the permanency that we expect in our writing ink when used for legal documents. And I not only hope, but believe, that the time will come when all photographs that claim to be of lasting interest will, as a matter of course, be permanent, and when no photographs whatever will be admitted to public Exhibitions—except, indeed, as curiosities or mere ephemeral illustrations—except such as are of undoubted permanence.

HOW THE BOLD PHOTOGRAPHER FACED A CHARGE OF THE SCOTS GREYS.

By G. Williams.

Mr. F. G. O. Stuart, the author of the Navy and Army types published by Messrs. Gregory & Co., of the Strand, had a somewhat novel experience at Aldershot last summer. The day was an ideal one for light, and Mr. Stuart, being desirous of putting his plates to a severe test for rapidity, suggested to Mr. Gregory, who was with him, that, as the day was most opportune for getting a picture of tent-pegging, he should approach the Colonel of the Scots Greys, then quartered at Aldershot, and ask for a section of four men to be sent out to the practice ground. This was done, and the Colonel at once entered into the idea, and gave orders for four well-tried sergeants to be got ready at once. The object Mr. Stuart had in view was to get a picture at the moment that the lances of the horsemen struck the pegs. It was therefore arranged that the camera should be placed immediately in front of the advancing cavalrymen, and about twenty-five yards from the pegs; and, in order not to run down the photographer, it was arranged that, immediately the pegs had been struck, the two left-hand men of the section were to wheel to the left, while the two on the right wheeled to the right. The result was eminently satisfactory, for, by a most extraordinary stroke of good luck, each man caught his peg, and the picture obtained is a perfect representation of four horses at full gallop coming straight at you. The shutter used was the Thornton-Pickard focal plane, and the exposure on this particular occasion was the one five hundredth part of a second.

A copy of this picture was submitted to His Imperial Majesty the Emperor of Russia during his recent stay at Balmoral, and, as Colonel-in-Chief to the regiment, he was much interested with it, and expressed a wish to retain the photograph, as well as another which showed the whole of the Scots Greys on parade.

THE EVENT OF THE YEAR.

By R. Child Bayley.

Captain Abney has declared that the photographic phenomena connected with what are known as the X rays are not, in any sense of the word, a new photography, but only the old photography we have had with us for so long. Whether this be so or not, the phrase, 'the new photography,' is now so generally applied to the process, that there are few who do not at once associate with it a Crookes' tube and the other necessary paraphernalia. Photographers, too, have evinced no small amount of interest in the discoveries of Professor Röntgen, and if they have not written learned papers on the subject, showing that the rays are this, that, or the other, as some professors have: they have, at least, done as much as any one else in the way of investigation and research; for it is a remarkable fact that, except as regards improvements in such details as the design of the tube, &c., we are now in the same position, as far as our knowledge of the rays is concerned, as we were at the publication of Röntgen's original paper.

It is most desirable, in considering the subject, to keep the distinctions which appear to exist between the various radiations known to be present in or near a Crookes' tube clearly in our minds. The cathode rays, which were the first to attract attention, are best regarded, for the present, at any rate, as distinct from the Röntgen rays, and these, again, should not be regarded as identical with the radiations investigated by Lenard, which may be called the Lenard rays. We will endeavour to summarise, in a few lines, the properties of these diverse radiations, and, in doing so, their differences will be indicated.

First, the cathode rays, investigated by Crookes. These may be taken as existing inside the tube. Falling on various substances enclosed in the tube, they excite phosphorescence, in some cases of an extremely vivid nature. The glass of the tube itself they cause to phosphoresce; opaque objects placed in their path stop the rays, as evidenced by the formation of a shadow on the phosphorescing substance; and, last, and most important characteristic from the inquirer's point of view, they can be deflected by means of a magnet. Two theories as to the nature of these rays have been put forward—one that they are disturbances or waves set up in the ether, the other that they are streams of gaseous molecules in rapid motion, and carrying charges of electricity. Either theory might account for the phosphorescence; all photographers know of invisible ether waves, which, under suitable conditions, can give rise to visible ether waves, while the violent bombardment of the glass or other phosphorescing material by a number of particles of gas might occasion similar effects. The 'electrified' gas theory is strongly supported by an experiment of Perrin's, which seems to prove conclusively that the cathode rays, be they what they may, are negatively electrified.

By inserting in a Crookes' tube a window or panel of aluminium, Lenard found, as he believed, that the cathode rays passed through it, and could exist outside the tube itself. The radiations which he studied outside the tube behave very much in the same way as those inside; and it is quite probable, although by no means proved, that the Lenard rays outside, and the cathode rays inside, the tube are one and the same kind of radiation. It is worth mentioning that these radiations are both deflected by a magnet, and that they affect the sensitive plate as do the Röntgen rays.

The Röntgen rays differ greatly from the foregoing. Like them, they act on the sensitive plate like light, but they are not, as far as is known, deflected by a magnet. A theory, which is not without plausibility, explains the Röntgen rays as transverse ether vibrations, that is to say, as vibrations in the ether similar in direction to sound waves in air. Another regards them as differing from light simply by being waves of much less length. As far as is known, the Röntgen rays can neither be polarised nor refracted, but this fact throws little light upon their nature, since it has yet to be known whether, supposing them to be light of very short wave-length, there is any substance of such a structure that it could polarise such light. They possess properties of an electrical nature, to which reference would be out of place here, but which, it may be said, may one day give the required clue as to their nature. Such properties certainly suggest that they are a kind of light the wave-length of which is extremely short. Considered photographically, there is little doubt that their action on the

plate is due to the same cause as is the case with that of ordinary light. Whether this action is direct or indirect cannot yet be stated definitely; that is to say, we cannot yet say whether the Röntgen rays affect the sensitive plate directly in the same way as light does, or whether, on meeting the film, they give rise to phosphorescence, which, in its turn, renders the silver bromide developable. Certainly, part of the action would seem to be due to the latter cause, since a sensitive plate is distinctly luminous to the eye if examined in perfect darkness in the path of the rays.

I can only repeat, in conclusion, that it is very desirable that, for the present, at any rate, these three kinds of radiation should be regarded as distinct. The fact that they have a common source in the Crookes' tube, and that some of their manifestations are similar in all three cases, are only additional reasons for emphasising the importance of those points in which they differ.

A LICENCE TO USE.

By Gambier Bolton, F.Z.S.

Last year I sent you a form of 'Licence to Use,' which, I am told, has been of considerable service to many of your readers. I now enclose a greatly improved form of 'licence,' and have filled it in with fictitious details. I have been asked to do this, as some of the blanks were not very well understood.

Licence to Use.

*Address*______________________________

*Date*___________________________189

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WHITE MATT AND COLOURED GLASS REFLECTORS IN PHOTO-MICROGRAPHY.

By R. L. Maddox, Hon. Fellow R.M.S., &c.

A brief notice of some experiments with a white matt surface and three different coloured glasses, backed by dead-black paper, used as reflectors in the place of the usual silvered mirror, may, as I have not seen any notice of such being used in photo-micrography, interest some of the readers of The British Journal Photographic Almanac. It will therefore form my trifling contribution to its pages.

White matt surfaces as reflectors are no novelty to microscopists, though, in the present day, rarely employed. Some little time since a Wedgwood tablet was tried as a reflecting surface in the place of the ordinary mirror, with sunlight illumination on a transparent or colourless object, using a high-power objective. The amount of detail found in the negative was rather surprising, and without any halation. The present trials, however, were made with artificial illumination from a one-inch wick petroleum lamp, using the broad side of the flame, and a low-power one-and-a-half-inch objective on a mounted brown transparent object—a bird's flea. Ordinary rather rapid plates were selected, and the same exposure, ten minutes, given in each case. To the back of the Wedgwood tablet was cemented near the top a strip of thin brass half an inch wide. This was bent twice at right angles so as exactly to fit over the brass rim of the ordinary mirror, a strip of the thin brass being also cemented to the lower part of the back of the tablet in order that, when placed over the mirror, it would lie parallel with its surface. The lamp was placed at one side with the flame level with the centre of the mirror, and a bull's-eye condenser placed at such a distance as to give a parallel beam of light that just filled the ordinary flat mirror. The sub-stage condenser, being duly centered, was racked until it gave an illuminated spot on a greyed glass, placed on the stage of the microscope, rather larger than the length of the object. The object was now placed on the stage and centered, the lamp, bull's-eye, and mirror were carefully arranged to give correct central illumination, and the sharpest focus found on the camera screen. A deep velvet collar was fixed over the front tube of the objective, and allowed to just touch the surface of the slide in order to exclude all extraneous light. The tablet was now placed over the mirror without deranging its position, the prior focus remaining unaltered. The room was darkened, and the light to the sub-stage condenser shut off by a card, the camera slide inserted, and, after waiting a few moments, the card was snatched away, to be replaced after the exposure of ten minutes. The development, using my usual developer, took thirty minutes, and yielded a slightly fogged plate, the image having nearly all the detail visible, but somewhat lacking in the necessary density. The tablet was carefully removed and a piece of flat, orange-coloured glass, backed by dead-black paper, substituted, and another exposure made for the same period. The development lasted twenty-three minutes, and furnished a negative with rather more density and slightly increased detail. A green glass of middle tint, backed like the former, was now carefully placed over the mirror and a similar exposure made. The development occupied fourteen minutes, and gave

a fairly good negative, the brown eyespots of the eyes being just visible, also the spiracles well seen, while the skeletal parts were forcibly rendered. The green glass was now replaced by a backed cobalt blue one, and a similar exposure given. The development took sixteen minutes, and furnished a negative with all the detail well shown, but some of the small stiff hairs projecting from the edge of the body were rather merged into the dark field. The results showed that these reflectors, which were not optically worked, only selected, furnished the means of obtaining—somewhat, it is true, at the expense of time—fairly good negatives of a rather difficult object, abounding in detail and contrast, and might in some cases perhaps be advantageously used under a proper exposure, which in this case was the same all through the experiments. It must be therefore noted that these experiments were simply tentative, both as regards exposure and development, and possibly the developer recommended with the plates would have been better than the one used.

In some work on dense and more or less transparent chitinous structures of insects, undertaken over thirty-five years since, on finding considerable difficulties in obtaining, with the collodion process and sunlight illumination, satisfactory negatives by transmitted light from the ordinary mirror, and before the days of coloured screens, the central portion of the back of the mounted slide used to be covered with a clear asphalt varnish (asphalt in benzole), of varying tints, according to requirement. The idea was that this would hinder the more transparent parts from being over-exposed, without much damaging the parts already too dense to photograph well. This plan proportionately increased the exposure, and fairly met the difficulty. All this leads to the supposition that tinted or coloured transparent objects, stained or otherwise, would, if mounted on suitably tinted glass slides, obviate the use of the ordinary coloured screen, and get rid of two reflecting surfaces. Moreover, it strikes me that optically worked steel flats, if tempered, one to a pure straw colour and another to a deep blue shade, would be advantageous as reflectors, with either sun or artificial light. In the hope of testing one, though very imperfectly, an old-fashioned wide steel busk was obtained, but the finely lined or striated surface gave no chance of success; therefore it was not tried, or the results would have been added to those described.

HOW TO CATCH FLIES.

By Frank M. Sutcliffe.

Next to a smoky fireplace, the greatest nuisance a photographer can have in his studio, the common house fly is the biggest. What photographer is there who has not been plagued with flies, and who is not familiar with the well-known words, 'I think my photographs are beautiful, but there are some spots on my dress, which look as if it had holes in it?'—spots which the photographer knows too well are portaits of the flies which have settled there for the moment. When flies abound, it is necessary to watch *their* flight rather than the fleeting expressions of the sitter's face, for not one sitter in a thousand can sit unmoved when a fly settles on his or her nose and refrain from brushing it off.

For many years I had a studio where the windows opened over a place where my neighbours threw all their over-ripe pears, herrings, and the like, and many a time have I seen half a dozen flies crawling over my sitter's coat, to say nothing of an occasional fly inside my camera, making strange marks as it walked across the plate at the time of exposure. How to get rid of these flies bothered me for years. I made friends with the spiders, as I did with a mouse who used to sit near my sink edge as I developed on a night; but there must be a limit even to the appetite of spiders, for my flies never seemed to decrease, though the spiders increased so that I have seen more than one spider's web inside my camera. Things began to be desperate, when a sitter one day said, 'I wonder you don't get an auralia or two in your studio. You would not have half as many flies if you had.' I asked if auralias were West Indian spiders, but was told that they were plants, with fig-like leaves, which by some strange process banished flies from wherever they were.

I got a nurseryman to send me two of the healthiest he had got, and in a few days not a fly was to be seen, and, except an odd one which comes in at the window by mistake, I have not seen one since.

P.S.—It seems to me that the title I have just written on top of this will lead some poor professionals to expect me to tell them how to entrap sitters into their studios. All I can say is, Don't try to entrap them at all, but show the very best work you can, and try *to excel it in taking each fresh sitter.* Don't do as a friend of my did—advertise 'Very cheap portraits,' and when a sitter went in say, 'Yes, I can take you cheap, if you like, but the cheap portraits are nobbut (only) very poor.' Then he would bring out two portraits (one very bad and the other good), and say, pointing to the poor one, 'Them's six shillin' a dozen, and them' (pointing to the good one) 'is a pound, as photographs is not like butcher's meat, a thing you want every day. You had much better have them at a pound a dozen.' Though my friend was an exceptionally good photographer, even these spider-and-fly tactics did not pay, and he had to break up his web for want of flies.

GELATINO-CHLORIDE PAPER TONING.

By the Rev. J. Carter Browne, D.D.

There are so many ramifications in the realm of photography that it is difficult to choose a subject for one's annual contribution to the forthcoming Almanac; but, having had some experience lately in the toning of P.O.P., I am glad of this opportunity of recording it. A few hints also for beginners may not be out of place.

I would always recommend the paper cut up to size, as usually sold in various-sized packets, as saving a great deal of trouble in cutting. The paper, being coated with gelatine, is in a highly hygrometric condition, and must be kept as fairly dry as possible, and, as the dark days are coming on, and printing may be prolonged, it is well to back the paper in the frame with some good blotting-paper, or, if quite dry, with some waterproof substance, to prevent any possibility of moisture finding its way to the ends of the paper, and so causing unequal toning.

To commence toning, place the prints in rain water for a couple of

minutes only, and then remove to a second bath. The short time in the first bath is recommended, to prevent the free silver from incorporating with the gelatine, and sometimes causing yellowness in the high lights. Keep in this second bath for two or three minutes. Now comes a somewhat important point; Transfer the prints to a third bath, with two or three grains of salt to the ounce; transfer to another bath, and even a fifth, thus eliminating all the free silver. The toning solution may be prepared in several different ways. Most operators prefer the sulphocyanide bath as recommended by the makers; but other salts may be used with very good effect. The sulphocyanide bath is prepared as follows:

Ammonium sulphocyanide	15 ounces.
Chloride of gold	1 grain.
Rain or distilled water	15 ounces.

In this immerse the prints after washing, and keep constantly on the move until toned to a slightly bluish-black colour; wash, and fix for fifteen minutes in a solution of hypo not stronger than ten per cent. Too strong a solution is apt to eat away the high lights, and also change the colour of the toned prints. But the method that I prefer is, after washing, to place in the sulphocyanide bath, without any gold, for ten or fifteen minutes; then place a little gold in the measure and pour into it some fresh sulpho solution, and, having thrown away the first bath, place them in this one. They tone so much more evenly and readily in this way, and only as much gold is used as the prints require. This second bath is kept for use as the first bath for the next batch of prints.

There is also another toning bath for those who do not care to use the sulphocyanide, made up as follows:—

Soda phosphate	1 drachm.
Chloride of gold	1 grain.
Rain or distilled water	15 ounces.

Yellow stains very seldom occur with this bath. The prints tone in about five minutes to a good purple black. If, however, warmer tones are desired, in the place of the phosphate use one and a half drachms of borax; but in this case the prints must only be washed lightly before toning, so as not to eliminate all the free silver.

Of the combined sulphocyanide and hypo bath I make no mention, as the possibility of fading is too great and too serious to be risked. It is well to mention that any hypo in the preliminary washing, or dirty fingers, are sure to cause stains sufficient to upset one's equanimity; hence great care and cleanliness must be exercised in using this paper. The squeegeeing operation is simple, but this, like all else, requires care. Some operators use ordinary glass or ferrotype, but the best results are only to be obtained with a piece of polished plate. This must be without scratches, and thoroughly cleansed from grease, and, when dry, rubbed over with French chalk and a pellet of cotton-wool, and the print squeegeed face down, and left to dry thoroughly, when, being lifted by a corner with a continuous sweep, the picture will easily come away perfectly glazed.

THE BUMP OF ORDER.

By G. R. Baker.

Although phrenologists say they do not believe in what the world calls 'bumps,' yet they divide the head up into certain imaginary sectional areas, and judge of a person's intellect and capabilities by the size of the brain and the development of these certain portions of the skull, which are popularly known as bumps. What the bump of order has to do with photography many of the readers of the Almanac will wonder, but old hands know the value of it. We are told by Professor Cross, who has been particularly successful not only in reading character and disposition, but also in diagnosing disease, that 'the organ of order gives a love of method and system.'

Method and system are particularly necessary in photographic and lantern work, and I emphasise this so that younger men at technical work may cultivate it. Experienced photographers have before now exposed a plate twice over, and lost perhaps two of their best subjects. How is that to be avoided? By strict attention to a *system*, and what better than changing the plate or film *directly* after the exposure has been made, notwithstanding conversational or other attractions. Then, in the dark room again, what is more important than all bottles and baths should have a definite place, and be in their place, so that by custom they may be found naturally. In lantern operating many a good apparatus would be preserved from damage by a little more attention to order and system. Condensers are often cracked because the lime is not turned regularly, and so becomes pitted, and the flame glances off at a tangent, and strikes and breaks the condenser, or scorches and burns the woodwork of body. Sometimes parts of the apparatus are found to be left behind when the operator gets to work, which would not be the case if a list of *necessaries* were inserted in the box of lantern and checked before starting. Negatives and slides should be numbered, and a proper list kept so that memory only had not to be relied on, for there are instances, after a large number of photographs have been taken, and through some cause (perhaps unavoidable) become mixed up, the subject could not positively be determined.

The greatest of all necessity for order is in regard to chemicals, and especially those of a poisonous nature, for constantly accidents are happening; the other day the wife of a doctor was poisoned through inadvertently taking pyrogallic acid instead of her medicine, because this bottle had been left in a sideboard cupboard instead of being in its proper place. All of these bottles should be under lock and key, and in a separate cupboard, or the dark room, to which no one but those privileged should have access. I cannot do better to wind up than quote from Professor Cross's *Popular Phrenology* regarding 'Order.' The individual who possesses it will be neat and precise in disposition, and will be able to plan and manage his work without severe application, because, before he starts a new undertaking, he is careful to plan it out in his mind, and then reduce it to proper action. This will save him and those connected with him much trouble and worry. If the organ of order is small, its possessor is slovenly and untidy, and very often unsuccessful. 'Order is Heaven's first law,' and he who would be really successful must be orderly in all his undertakings.

A ROUTE THROUGH THE BERNESE OBERLAND FOR A PHOTOGRAPHER.

By H. Selby.

With reference to your invitation, Mr. Editor, to contribute something to your Almanac for 1897, I fear I am not competent to instruct my fellow-photographers in any purely photographic matters. It has occurred to me, however, that any of your readers who may be contemplating a visit to Switzerland may be interested to know a good route—one in which there is a maximum of good things and a minimum of uninteresting ones. Switzerland is a fairly large country, specially considering the small show it makes on a map of Europe. The majority of us have to content ourselves with a holiday of from two to three weeks, and for such a period, to a good walker, the route which I followed during the past summer holiday should recommend itself as covering the best part of that portion of Switzerland known as the Bernese Oberland.

Now, it is of importance to know the best time to go, and the most comfortable way of going. Probably the best time to go is about June 20. The main roads are then generally open—such, I mean, as the Furka Pass, the Grimsel, and the Gemmi. The hotels, too, are not crowded so early at that time, and there is the great additional advantage of long days. Going as I did in the early part of June, I was driven back from the Furka Pass by a heavy snowstorm, and, besides that, there were sixty feet of snow between the Furka and the Grimsel, and gangs of men were busy tunnelling through it. About June 20 several of the high-situated hotels open, such as the Furka, the Grimsel, the Gemmi, and the Scheideggs.

Now, as to the way to go. I am inclined to strongly recommend the Dover and Ostend route, *viâ* the Alsace-Lorraine line to Bâle, through Luxembourg, Metz, and Strasbourg. The steamers are fine and very fast, and the train, with through carriages, very comfortable. Each compartment has a lavatory, and the day train, which leaves Ostend at about three a.m., has a dining car. Leaving Victoria or Charing Cross in the evening, one arrives at Bâle at 8.15 the following evening. The following morning Lucerne, the favourite starting-place, may be reached in a couple of hours.

Lucerne is a remarkably interesting city; but my intention was to see the country, and not towns. So I pushed on at once by steamer to Küssnach, and climbed up the Rigi on foot and down to Weggis. It is fashionable to laugh at the Rigi, and certainly as a mountain it is poor, but on a fine day the view from the summit is about the finest in Switzerland. I had great luck, and saw the whole 120 miles of snow-covered mountains as it is seldom seen. For the lazy ones there is a railway up from two points. The next day's route is by steamer to Fluelen, a most delightful route, in which the hand camera may be constantly in use, not only for the mountain and lake views, but also for the charming little villages where the boat stops. From Fluelen in the afternoon a pleasant and fine walk may be taken along the Axenstrasse to Brunnen, whence train or steamer will take one back to Fluelen. Next day take train to Amsteg, and walk up the grand St. Gotthard Road along the river Reuss. This, and the Grimsel road between Handegg Fall and Meiringen, are the two finest roads in the Oberland. The walk from Amsteg to Andermatt is

easily within the powers of an ordinary pedestrian, with a capital hotel at Wasen for lunch. The next day's walk is from Andermatt, over the Furka Pass, to the Rhône Glacier Hotel. (This I was unable to accomplish owing to the heavy snow. A week later it would have been all right. Having to make for Meiringen, where I had sent on my traps, I had to make a tremendously-long circuit *viâ* Fluelen, Alpnach, and the Brunig Pass.) Next day walk from the Rhône Glacier to Meiringen by the Grimsel Hospice and the Handegg Fall. The latter is a magnificent thing—the river falls 250 feet into a deep gorge with a roar like thunder. From this point to Innertkirchen, some eight or ten miles, the road is superb. From Meiringen to Grindelwald, over the Greater Scheidegg, is merely a pony track, quite unmistakable and the feature of the walk is the grand Wetterhorn, along the base of which the track goes right away to Grindelwald. From the latter place to Lauterbrunnen, over the Lesser Scheidegg, is finer still. It is again a track, and from the summit the magnificent Jungfrau, the Mönch, and the Eiger are towering up into the clouds, apparently quite close. The panorama of mountains here is absolutely grand, and there is the additional advantage of a first-class hotel, where a capital lunch may be had. From the Lesser Scheidegg down to the Lauterbrunnen Valley there is no lack of variety, although the mountains are behind, for from the village of Wengen the descent by the winding track is one of the steepest I ever met with, and is very trying to the knees. However, the view up the Thal is very fine, and the marvellous fall, the Staubach, with its clear, unbroken fall of nearly 1000 feet, is right in front.

From Lauterbrunnen a day off, as it were, may be indulged in. The cable and electric railways may be taken to Mürren, from whence there is a variety of walks. The view from the village, which lies over 5000 feet above the sea, is alone sufficient reward, as it includes a large portion of the Jungfrau group.

The next day's route is to Interlaken, a grand walk of eight miles from Lauterbrunnen. After lunch at Interlaken, the steamer up Lake Brienz should be taken to Giessbach, to visit the fall, which descends with various breaks about 1000 feet to the lake. The following day should be devoted to a visit to the Schynigge Platte, one of the finest viewpoints in the Oberland. I walked up and down—a matter of 4600 feet up from Interlaken. There is, however, a railway up, and a good lunch can be got at the hotel on the summit. The panorama is very grand, including all the Oberland giants. From Interlaken, a steamer takes one to Thun by the lake of that name, and the remainder of the day can be devoted to the interesting town, with its finely placed castle and cathedral.

From Thun I took an excursion, which absorbed three days—namely, train or steamer to Spiez (a village with a lovely Schloss, &c.), and a walk to Kandersteg. Thence up and up to the famous Gemmi Pass, whence we obtain our only view of the Alps of the Valais, including Monte Rosa and the Matterhorn—some thirty miles off. If the day is fine and clear, as I had it, these mountains are easily distinguishable ; but I must admit that, owing to the earliness of the season, I had a long four hours' tramp in the snow, which is extremely tiring. From the Gemmi back to Thun admits of no variation for the return journey.

The final day's work may include short visits to Berne and Bâle—devoting a few hours to each—preparatory to the return journey home.

I did the whole of the trip described in two and a half weeks; but more should be devoted to it, as I admit I somewhat overdid it. But, as a round, it is magnificent, and for one in better condition than I was it presents no difficulties, and I think those who know the country will admit it is a very grand route, and one which introduces one fairly well to all that is best worthy of a visit in the Bernese Oberland.

As to the camera to be taken on such a route, I think a light quarter-plate—I took Shew's Eclipse—quite heavy enough. The Eclipse camera has the advantage of lightness and portability, and can be used equally well in the hand or on a tripod. I certainly advise a tripod, and films of medium rapidity, as snow is an awkward thing to deal with in the matter of development, if shutter exposures are given.

REMINISCENCES OF PHOTOGRAPHIC WANDERINGS.

By Charles Stephens, M.A.

What happy memories these words bring back, photographic wanderings! Well, so they were, though the camera had to give way sometimes to other interests; still it is now of the camera I must speak, from the days when we (my wife being my assistant in various ways) took our photographic stock in trade in a large box or basket, not quite so large as a modern transatlantic trunk, to the present time, when a modest hand camera and small parcel of films are all the properties required. These wanderings have taken us amongst Swiss mountains and valleys, whose beauty and grandeur one can never forget; or the charm of life, for a time, in the land of ice and snow. Then the scene changed to the quaint towns and picturesque villages of Holland; then to Scotland, with its romantic loveliness of mountain, moor, rock, and glen. Again, one remembers bright days passed in some of our large northern seaports, and many a visit to beautiful Devonshire, the Isle of Wight, with all its varied charms and interesting surroundings; and I must not forget the Channel Islands, with all their brilliant colouring and clear atmosphere, especially Guernsey, the 'Isle of Carnations,' and little Sark, both so rich in subjects for the photographer as well as for the artist of brush or pencil.

All these 'happy holiday grounds,' and many others I could name, are full of subjects for the camera, and I think that a collection of 'Bits,' the results of such wanderings, and forming almost, one may say, a pictorial diary, makes a very delightful possession. In looking over the said 'Bits' from time to time, one is reminded, amongst other memories, of funny little episodes in day of yore.

On one occasion, on the sands of a watering-place crowded with excursionists, I was asked by a worthy woman with a large family around her if I would take the lot cheap. At another time, when in an old-world Devonshire fishing village, trying to get some 'Bits' of boats on the sand before the tide came up, my lens was suddenly darkened, and, on looking for the cause (I was under the focussing cloth at the time), I found two very robust females close to the lens, one observing to the other, 'Come on, Betsy, let's be took.' And the old gentleman who wanted a

bargain. 'Could I do his house and garden—in fact, all his lares and penates—indoors and out, for the modest sum of 5*s.*?'

These reminiscences extend over a good many years, from the days of wet collodion, tents, &c., to the present luxurious mode of working with the hand camera and films, without which I never leave home even for the shortest of trips, and seldom take any larger apparatus away with me.

A TRIP TO THE BASQUE COUNTRY.

By Major C. Gardner Vatcher.

This last winter we went down to the south of France for several months. No great incident occurred till we reached Paris. But at the Orleans Station I was charged over weight, although on the Ouest no extra charge beyond the usual penny registration fee had been made. I found that the scales weighed differently on different railways the same day. I will say this for the French, you can travel 1000 miles with a bike, and, if with your luggage it is under weight, a penny is all you have to pay.

Our first stopping place was Bordeaux, a splendid town where there is any amount to see and do. The Garonne is very wide there, and is teeming with life. The quays are very busy, ships going to all parts of the world with the produce of the district. There are also old buildings to photograph. I took lots of very successful snap-shots and used my stand several times. There are steam launches that go up and down the river to the vineyards at Pauillac, where, if you journey at that time of the year, you can see the process of wine-making. Arcachon is within easy reach of Bordeaux; there they cultivate oysters on a large scale, the parks are worth seeing.

The railway passes through what is called the "Landes," formerly marsh land and sandy wastes, but now pine forests and cultivated fields. This was started by Napoleon III., and year by year they add to it. Our next halt was at Biarritz, a fashionable English winter resort. Mr. Gladstone often goes there, his favourite occupation being to go down to the Virgin's Rock, and watch the grand waves that roll into the Bay of Biscay and break there. I took some very fine ones during our long stay there. The stock things to take are the waves, the 'Rock,' the fishermen's harbour from several points of view, the sardine fishermen and sellers, getting in and out of harbour during boisterous weather, &c.

We went for a short trip to Pau and Lourdes, stopping at the former; but, as we had rain most of the time we were there, I did not do much photographic biz. They are both very pretty. I was astonished at the growth of Lourdes from a small village of comparatively a few years ago. I asked several of the natives if they believed in the miracles, and, of course, I got a reply in the affirmative, though they acknowledged that they never heard of a native being cured; nervous oomplaints seem to be the cures most often heard of. The Grotto where the apparition occurred is remarkable from the number of crutches and wooden legs, said to be of those cured, hung about. I saw lots of loathsome beggars there on whom the miraculous waters would have a beneficial effect, if only to take the dirt off, but possibly they think it more profitable to remain as they were.

We also went for a trip into Spain as far as St. Sebastian, and a small place called Zarhauz an hour further on, where the Queen of Spain and Court come for the summer. The town of St. Sebastian is modern, having been burnt down by our soldiers in 1813. The Citadel contains some tombs of some English officers of the Foreign Legion who fell there in the Carlist war of 1837. Another thing of interest is a large bull ring. There are very pretty excursions to be made in the environs, where you could almost photograph everlastingly. On the way back to Biarritz, we stopped at a small walled-in place called Fuentarabia, said to be like Seville, where there was a religious procession. We did not think much of the latter, but the journey from Hendaye by water was lovely. The best view can be taken near the landing-place. St. Jean de Luz is another pretty quaint old place on the way that we stopped at. Bayonne is only about a quarter of an hour from Biarritz on the way to Bordeaux. It is strongly fortified, and is interesting to English people because of the two cemeteries containing the bodies of the Guards who fell in our campaign of 1813. They are some little way out of the town. Coming home, we went along the west coast to Nantes, a very large and busy town, with part of an old castle, now used as a prison, to show its great antiquity, Rennes, and St. Malo, having lots of negatives to show for a very enjoyable trip.

PHOTOGRAPHIC PATENTS AND PHOTOGRAPHIC PATENTEES.

By E. W. Foxlee.

When engaged in making searches on behalf of patent agents and others in connexion with photography and kindred subjects, I have frequently been impressed, almost amused, at the obvious invalidity of many patents, which have been anticipated, by the invention having been previously published or even patented before. Many old inventions that were described many years ago in the different journals have formed the subject of modern patents; but, of course, if such patents were litigated, in a case for infringement, and what had been done in the past brought forward, the patent would be invalidated. This state of things should not exist, seeing that the annual profits of the Patent Office are something like 100,000*l*. However, we must take the thing as it is, and it rests with the applicant to find out for himself whether his invention is original or not. The Office simply pockets the fees, asking no questions, and grants a patent, which may be worthless if it is ever litigated; for, after all, that is the only real way to prove the validity or otherwise of a patent.

In a specification, recently published, I noticed two claims, amongst others, that would quite upset the patent, even supposing the other claims were good. One bad claim, amongst a dozen good ones, is sufficient to nullify an English patent. It is true that a bad claim may afterwards be disclaimed, but, in an action for infringement, the defendant has the privilege of opposing the disclaimer, and is frequently successful, in which case the patent becomes void. Even if a disclaimer is allowed, no damages are given for the use of the invention prior to the disclaimer, unless the patentee succeeds in proving to the 'satisfaction of the Court that his original claim was framed in good faith and with reasonable skill and knowledge.' Litigating a patent is always a costly affair, as

most Chancery proceedings are, and so much depends upon expert evidence, which is also expensive.

It was mentioned in the JOURNAL, a little while back, that no fewer than 137 patents were sealed, during the seven years ending 1891, in connexion with photographic shutters alone. It would be interesting to know what proportion of these patents would have proved valid if they had been contested? Another interesting item would be to learn how many of them have yielded a profit to the patentees? The same queries may also be asked with reference to photographic patents generally.

Patents are now to be had for a comparatively small sum, and the prevailing idea with some is, when they have made some new, or surmised new, invention, to directly apply for a patent for it, without considering for a moment whether there is any commercial value in it, or whether the invention is really new. Unless an invention can be turned to a profitable account, of what use is there in going to the cost of a patent for it? An invention may be *bonâ-fide* new and original so far as the present inventor is aware, yet it may actually be 'as old as the hills.' Inventors are frequently very sanguine as to the originality of their conceptions and the commercial value of their inventions, to make a sufficient inquiry as to the former, and give proper consideration to the latter, before taking a patent. In estimating the commercial value of an invention, the sanguine patentee too often overlooks the fact that the world has hitherto done without it, and that it is possible to do so still.

A large proportion of the specifications of modern photographic patents are drawn, and the patents taken out, by the inventors themselves. That is frequently a mistake. If the invention promises to be a valuable one, this work had always better be placed in the hands of an experienced patent agent. He will take care to frame the specification in such a way that there is no ambiguity in the wording, and that only such claims are made as can be substantiated if the patent is ever litigated, that is, supposing he is put in possession of what has previously been done in that particular direction. In the specification alluded to above, a couple of the claims are for old things as they stand, and they invalidate the patent. If, however, they had been omitted, or were made only in combination with other parts of the process, a valid patent for the process might probably have been secured. It does not follow that, because a portion of an invention may be old, a sound patent may not be obtained. A combination of old and well-known things, to produce a new result, may be made the subject of a perfectly valid patent; but the specification need be drawn up by one well versed in patent law.

SNOW PICTURES.

By REV. F. C. LAMBERT, M.A.

WE are accustomed to look for this always welcome volume about the time of year that our young folks are thinking of snowballs and skating, while we old fogies are more interested in our chances of getting a few camera shots at 'nature's purest mantle.' A few general hints on snow pictures may therefore be helpful and opportune to those who have not had much past experience in the matter.

1. In all pictorial work the first consideration should be that of *general effect.* In snow scenes this very nearly always is that of lightness, brightness, frequently to the extent of dazzling whiteness. In selecting our subjects this should be kept in mind, so that any large object or portion of the picture likely to come out very dull and dark may be avoided.

2. The actual contrasts of the lights and darks of nature under these conditions are usually many times greater than the available range of, say, the blackest platinum and whitest paper. Consequently compromise in some form is imperative. It therefore becomes an important question as to whether we shall compress the light or dark end of the scale. The fact, however, that the general impression is light, seems to point to the chief attention being given to this end of the available series of tones.

3. While it is true that contrasts of strong lights and darks accentuate each other, it is most important to bear in mind also that it is usually at the expense of gradation. But, seeing that gradation is of the very essence of the light tones, it becomes a question whether it is better to aim at great delicacy and gradation rather than violent contrasts.

4. Great care is needed to avoid spottiness or patchiness, as being diametrically opposed to breadth. In nature we are apt to overlook this point, partly being allured by local or accidental colour, partly by force of habit in not noticing much that the eye sees, and partly from the size scale of nature being so very much longer than our photographs.

5. As a general rule, the foreground is by far the most important so far as selection, composition, &c., are concerned. This is especially the case with snow scenes. Very frequently the only possible foreground is of a dark (slow-acting) colour, and consequeutly requiring an exposure so long that it means over-exposure for the more distant or lighter parts. Hence the utmost care is needed to avoid rendering such foreground objects either on mere black silhouettes—from under-exposure, or losing gradation by over-exposure in the lighter and more distant portions.

GLOSSY CENTRES AND MATT-SURFACE MARGINS ON PRINTS.

By T. C. Sole (Balfour, Cape Colony).

After reading the contribution to the Almanac for 1896 by Mr. F. J. Mortimer, *A Paste-down Effect*, an idea occurred to me that a more simple and effective plan could be adopted, viz., ask the plate-glass manufacturers, or those who make the ground-glass slabs for squeegeeing on, whether they could not produce these slabs with a *glossy centre* and *matt-surface margin*, in quarter-plate, half-plate, and whole-plate sizes, square, dome, and cushion shapes? I agree with Mr. Mortimer as to the 'pretty effect,' having tried it some years back; but I think, if we could manage to get the glass slabs made, there would be a great demand for them, and we would then be able to introduce 'something new' in *cartes-de-visite* and cabinet photographs, and also landscape (whole-plate or larger) pictures. I would certainly like to get some of the slabs.

DARK-ROOM EXPERIENCES.

By 'Hussar.'

Necessity, the mother of invention, often compels the photographer, when in out-of-the-way places, to make use of sundry shifts and expedients in order to furnish himself with something that will do duty for a dark room. While travelling in India away from the line of railway and living in what are called dâk bungalows, or rest houses, I have often been put to it to find a light-tight room in which to develop the plates I have exposed on some old fort, temple, or scene, I met with as I jogged along the Empress Queen's highway. The most useful contrivance I found was to provide myself with three or four curtains two and a half yards long by two yards wide, one of which was of ruby fabric and the others of black double twill; each curtain had small rings at one end, and thus could be easily fastened up over the door and windows. When not in use, they took up no room, and, moreover, could be utilised to wrap round plates and camera to keep off dust and damp. In all these dâk bungalows there are bath-rooms, which, when hung round with these above-mentioned curtains, answer very fairly the purpose required, and there is always a plentiful supply of water to be obtained from the bungalow water-carrier.

A friend of mine, an engineer officer, whose duty took him often in unfrequented ways in Central India, where old ruined temples, lovely bits of scenery, and curious specimens of wild jungle folk were often to be met with, had a very light palanquin constructed of bamboo covered with canvas and lined with stout paper, which, when the curtains over the entrance were closed, was perfectly light-tight. There was also a small window, with ruby glass at one end, and a drawer could be pulled out which made a developing sink. The palanquin was of sufficient height to enable the occupier to sit up with his legs crossed and manipulate his plates. This contrivance was carried about with him by coolies on his expeditions, and, in addition to its use as a dark room, his camera and plates were stowed away in it on the march, and he was able to travel in it himself sometimes when inclined to indulge in the *dolce far niente.*

When living in tents, it is very difficult, even with double roof and walls, to keep the bright Indian sun out, and therefore it is advisable to defer developing operations till night time. When using dark rooms in India, and especially of the back room description, it is necessary to to give a good look round that no snake, scorpion, or other venomous creature, has taken up his abode there. I remember some years ago I was carefully shut up in one of these dark rooms, I had a very faint light, and I was developing a valuable plate which was coming up beautifully, when I felt a long, cold, damp body fall on the back of my neck from the thatched roof; it then fell on the floor, and took refuge among some bottles put away in a corner. I felt convinced it was a krait, a most deadly kind of snake, especially as I had killed one the day before in my verandah. However, after I had poured off the developer and carefully covered up the plate, I found on opening the door it was nothing more than a very large lizard. Till I found out what it was, I admit I did not feel very comfortable, I was like a rat in a trap.

At one place I was photographing an old palace of the Emperor Akbar. the bungalow put at the disposal of visitors by the Government did not

possess a bath-room; there were, however, a number of thick wadded curtains, such as are used by the natives to close up the open arches of their zenanas; these I arranged round a bedstead, leaving a small strip open, which I covered with my ruby fabric curtain; I then crept underneath the bed, and I had a really very fair dark room, all things considered, though I won't say it was a particularly cool one. All went well till I wanted to come out, and I then found that, not being built on the same lines as a snake, I could not wriggle my way out; I had then to call my native servant to the rescue, he grasped the situation and my legs at the same time, and pulled me out. Taking the heat, dust, and stuffiness into consideration, I did not feel inclined to repeat the experiment.

I had once a very convenient form of dark tent which I used for changing plates only; it opened like a book, and was held open at right angles by a stout wire, it was well ventilated and had a sliding window with ruby glass, the cloth part over the head was like others of the kind, and the end was drawn round the body by a string. When not in use, it folded up flat and took little room. Sitting on a chair with the tent on my lap, I could change plates to my heart's content, and it stood me in good stead when I was photographing the Taj at Agra. I am afraid to say how many plates I exposed, but the surpassing loveliness of the place was a sufficient excuse; and, well, I don't suppose the plate-makers minded.

My experience of hotel dark rooms in Europe has not been extensive. I have not *always* found them light-tight, nor the ruby light particularly safe; those constructed on scientific principles, *vide* advertisements of wood, and something of the size and shape of sentry boxes, were very hot, and, the boards having shrunk, a good deal of papering inside was required before they were fit for use.

ART BY MACHINERY.

By S. E. Kelf.

In a popular paper, some little time ago, there was a rather noticeable sketch, amongst others, of outdoor sports. The sketch would perhaps have not been so noticeable, as it was in a corner, but for its title; for there was only the usual tripod, or three lines coming to a point, on the top of which looked like a camera, covered by the usual focussing cloth, under which was supposed to be the operator, unrecognisable, of course, and the thing was labelled, 'Art by Machinery.' But in the title was the sting. Without doubt, there was more than a grain of satire there. The sketcher, artist, or caricaturist, whichever name he would like to go by, perhaps looked down upon that poor mortal who presumed to attend a meeting of sports to obtain what was very likely considered the sole perquisite or property of the sketcher. Of course, it is only conjecture, but very likely the photographer's soul was sorely grieved when he saw himself depicted with such a superscription; or perhaps the artist knew something of photography, and was aware of its limitations for illustrative purposes at least; or perhaps he was only giving a kindly and broad hint to the 'snap-shottist,' whose work sometimes gets into print, to the detriment of the sketchers—whose doesn't?

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THE "WELLINGTON"

PLATINO-MATT BROMIDE PAPER.

From week to week, if carefully followed to note the comparison, there is no doubt but that the sketchers are the more successful competitors. Although not so truthful, their work is about as truthful as the general public require. In the matter of sketching landscapes, places of interest, races, outdoor sports, or interior meetings, the photographer cannot compete so well as the artist. No one knows this better than the latter. Supposing it be sports, well, the 'finishes' are the most important, and generally they come on when the light is fading—the sun going down. Perhaps you have distance to contend with, or onlookers block your view. Speed, too—say a bicycle race, at the rate of a suburban express—cannot every time be got quite sharp, fully exposed, and right in the centre of the plate, with the images a decent size. Pins' heads won't do. Then as to landscapes. See how nicely a sketcher can blend one view into another, and draw an artistic border round the whole; how he can leave out all the buildings or trees that do not give any force to his sketch. Of this the higher-class illustrated papers have examples almost every issue. Something is wanted—not so much talk of how certain makes of cameras have been carried over glacial mountains and under tropical suns, or how to restore a faded or worthless negative—but advice and instruction how to produce, for certain, a good artistic and picturesque photograph; not so much chatter about the machine — the lens, the shutters, the plates, the developers, or the printing papers, the toners, and the fixers—but more about the views, the subjects, the skies, the clouds, the foregrounds, and the perspectives—more, in fact, about 'art' and less about 'machinery.'

POTASSIUM BICHROMATE AND PRINTING-OUT PAPER.

By Milton B. Punnett.

While experimenting with a view to improving the whites yielded by a printing-out emulsion, the writer tried the following formula, which, although it did not answer the purpose sought, still had advantages making it worthy of being recorded :—

Water	32 ounces.
Common salt	½ ounce.
Potassium bichromate	5 grains.

Many of the commercial printing-out papers turn decidedly yellow in the first wash water, especially if they are not very fresh. This discolouration generally disappears in the hypo bath, but, while it is present, it increases more or less the difficulty of judging the tone.

If the prints, before or after washing, are placed for about five minutes in the above bath and then washed well, the whites will be purified, and subsequent toning will be found easier and more rapid. Where it is intended to tone in platinum after the gold, this bath will hasten matters.

Regarding the purity of the whites of the finished print, I have failed to find any special advantage in the use of this bath, it, seemingly, removing only the discolouration which the hypo bath would remove. It does, however, have a slight reducing effect on the image, and this must be taken into consideration in printing.

A COMBINED TONING AND FIXING BATH, FROM TWO SEPARATE SOLUTIONS, FOR GELATINE AND CHLORIDE PAPER.

By G. Fernau.

There is a widespread distrust as to the permanency of the prints toned in a single toning and fixing bath, but, after numerous experiments made with rival processes in this important branch of photography, I venture to affirm that a well-conducted process on a two-separate solution basis is as efficient and permanent as any other, and will ultimately supersede many for which supremacy is claimed.

The main points to be observed in a combined two-separate solution's manipulation are :—

First.—To print deeply in all cases.

Second.—To tone, as a rule, ten minutes at least beyond the time when the toning appears to be completed.

Third.—To be very particular in not allowing the bath to receive more prints than the quantity of gold chloride it contains will permit.

Fourth.—To wash after toning in running water for at least one hour, or, in the absence of running water, in at least eight changes, at intervals of fifteen minutes, using large trays that hold two, three, or four prints.

This is applicable, as already set forth above, not to a single combined bath, of which I cannot speak favourably, except under special conditions, but of a twofold separate combined solution, the component parts of which are, on the one side, hyposulphite of soda, alum, and sulphate of soda ; and, on the other side, gold chloride and acetate of lead, both solutions being mixed at the time of using, in the proportions given by eminent companies, as per formula indicated at the foot of this article.

Brilliant, even, and relatively permanent prints will be obtained by strictly adhering to the general rules delineated above and amplified hereafter—much better results, to my thinking, than with the sulphocyanide process, with which I have had more failures than successes, although I have spared neither trouble nor perseverance in the pursuit of a vaunted panacea.

First.—The printing must be pursued as long as the maintenance of the details in toning will allow. The shades must reach a dark brown or bronzed tint, even at the expense of the whiteness of the high lights, for these, if turned more or less yellow or grey, according to the nature of the negative, will, in toning, gradually become restored, if not to their primitive tints, at least to a bright, pleasant appearance.

Second. — The principle by which I am guided in carrying the duration of toning beyond apparent perfection is to secure complete fixation. No deterioration of the print is perceptible by acting in such a way, thirty minutes being the average time wanted to ensure a perfect picture, under ordinary conditions of negative, atmosphere, and temperature.

Third.—Success, more than any other condition, depends on the proper quantity of gold chloride being used, say 2 grains for every

sheet of paper that is to be printed. Thus, a tube containing 15 grains will allow about 100 half-plate pieces $\left(\frac{15 \times 13\frac{1}{2}}{2}\right)$ to be toned smoothly and satisfactorily, at a bath temperature of 50° to 55° F. Thus also 8 ounces, poured out of a solution containing 15 grains of gold chloride and dissolved in 8 ounces of water, will, when mixed in due proportions with the hypo, alum, and sulphate bath, tone $\frac{15 \times 13\frac{1}{2}}{2 \times 8}$, or $12\frac{1}{2}$ pieces of half-plate size, admitting that a sheet of paper measures $24\frac{1}{2} \times 17$ inches, or $416\frac{1}{2}$ square inches, which, divided by $30\frac{7}{8}$ inches, or the square of a $6\frac{1}{2} \times 4\frac{3}{4}$ piece, give $13\frac{1}{2}$ pieces to the sheet.

At this rate, taking 12 pieces, half-plate size, as the standing toning capacity of a $\frac{15 \times 13\frac{1}{2}}{2 \times 8}$ solution, the following table will, at a glance, indicate the quantity of half-plate pieces that can, and ought to be, toned in the solution made up according to formula, viz :

Gold and Acetate of Lead Solution. Drachms.	Hypo, Alum, and Sulphate Solution. Ounces.	Half-plate Prints to be Toned in Mixture.
1	1	$1\frac{1}{2}$
2	2	3
3	3	$4\frac{1}{2}$
4	4	6
5	5	$7\frac{1}{2}$
6	6	9
7	7	$10\frac{1}{2}$
8	8	12

It is advisable to limit the quantity of the mixed bath to the quantity of prints to be toned, and, this being done, the used bath is to be thrown away as absolutely useless for further toning; but, no such restriction having been observed, the used bath may be retained for a few days, and used again after filtering, but only for exactly as many prints as have been left untoned previously, so that, if more prints are to be toned than the gold contained in the surplus, the bath must be strengthened to the extent of $1\frac{1}{8}$ ounce mixture of the two toning elements for every $1\frac{1}{2}$ piece, as per our table.

These rules are to be strictly adhered to to ensure permanency, for, contrary to a sulphocyanide process, for example, in which the exhaustion of gold chloride becomes very apparent by the gradual weakness and poorness of the image, and, ultimately, the cessation of toning, a combined bath will still show vitality after absorption of the gold, or after the permanency element has disappeared. What happens is that sulphur has been deposited on the print instead of gold, one toning being undistinguishable from the other, even to the most experienced eye.

With sulphur toning rapid fading is sure to follow, all by our own fault.

Fourth.—Little is to be added to this last condition of success. Pure water will, of course, greatly facilitate the elimination of hypo and organic impurities, but, in the absence of such desideratum, let, if possible, the prints be washed, to begin with, in a tray of good rain water, and the washing be continued with filtered water under the tap.

I send you, per post, a few prints manipulated in the manner advocated above. Allow them to be hung up, exposed to a bright light, side by side with other prints, for which supremacy of permanency is claimed, and time will be the judge whether this article has been written in vain.

Formula of a Combined Toning and Fixing Bath, as given by the Paget Prize Plate Company, but not recommended by them.

Stock Solution No. 1.

Hyposulphite of soda	20 ounces.
Potash alum	5 ,,
Sulphate of soda (not sulphite)	14 ,,
Water up to	160 ,,

Dissolve the hypo, alum, and sulphate each in 40 ounces of hot water separately. Mix well first the hypo and alum so dissolved, and then add the dissolved sulphate. Measure the whole of this compound and make up to 160 ounces with water. Let the solution settle down for twenty-four hours, then filter, after which it is ready for use. In this state it will keep indefinitely,

Stock Solution No. 2.

Chloride of gold	15 grains.
Acetate of lead	64 ,,
Distilled water	8 ounces.

Dissolve the acetate of lead in the 8 ounces of water, and add the gold chloride. A heavy precipitate is formed, and, before pouring out any portion of it for mixture with stock No. 1., the bottle must be thoroughly shaken; after mixing, the precipitate redissolves, and the colour from light red gradually becomes white and transparent, when it is ready for use.

For Use.

Mix 8 parts of No. 1 with 1 part of No. 2. No washing before toning, no fixing after toning, thorough washing after toning.

SESQUICARBONATE OF AMMONIA.

By W. B. Bolton.

In an article contributed to last year's Almanac I endeavoured to make clear the relative developing values of the caustic and carbonated alkalies, but, unfortunately, the table of values given in the latter part of the book escaped correction in so far as the figures relating to sesqui-carbonate of ammonia are concerned.

Taking the same view of the latter salt as of the res — amely, that

their developing values depend upon the amount of free alkali they contain (in other words, upon the quantity of alkali over and above that required to form *bicarbonate*, which I regard as a restrainer, or, at the very best, neutral)—then the quantities of sesquicarbonate given in the last column of the table are far too small, in fact the actual equivalent of the salt, viz., 290, should be taken as its comparative developing value.

The following comparison of the different grades, taking soda as the base, repeated from last year, will, I think, make the matter sufficiently clear :—

	Equivalent.			Alkali.	Restrainer.
Caustic soda	40	$NaHO$	=	$NaHO$	—
Carbonate of soda	106	$Na_2CO_3H_2O$	=	$NaHO$ +	$NaHCO_3$
Sesquicarbonate of soda	310	$Na_2CO_32Na + HCO_32H_2O$	=	$NaHO$ +	$3NaHCO_3 + H_2O$
Bicarbonate of soda	84	$NaHCO_3$	=	—	$NaHCO_3$

Thus 106 parts of normal carbonate, or 310 of the sesquicarbonate, each contain 40 parts of free hydrate, while the bicarbonate contains none at all; but, as I have already shown in the article referred to, the bicarbonate or restrainer, being present in different proportions in the normal and sesquicarbonates, and altogether absent from the hydrate, the different compounds are in no way comparable on equal terms. Though the normal carbonates of soda, potash, or ammonia may have their relative values stated in actual figures, such is not the case in attempting to compare a normal with a sesquicarbonate, since it is impossible to eliminate the restraining action of the extra carbonic acid. For this reason it is only right that the table should be divided into three separate sections relating to the hydrates, normal carbonates, and sequicarbonates respectively.

Again, the title given to my table is not the one I should choose. The term "equivalence," if applied in a purely chemical sense, is erroneous when used in conjunction with my table, though correct when applied to the one below it, which differs from it very materially. The "*developing value of the alkalies*" is the term I should choose.

ARTIGUE'S METHOD OF CARBON PRINTING WITHOUT TRANSFER.

By JAMES A. SINCLAIR, F.R.P.S.

ARTIGUE paper, according to a recent number of THE BRITISH JOURNAL OF PHOTOGRAPHY, amuses some half-dozen dilettanti photographers. Since the opening of the great Exhibitions, numerous other photographers, who have seen the delicate and charming results shown by Schoeller, Puyo, Maskell, and Pringle, are seeking for similar amusement, and constantly ask for some simple and brief instructions for working the process. These I shall endeavour to give without commenting upon any of the extremely interesting historical notes connected with this system of carbon printing.

Artigue paper, when purchased, consists of extremely fine paper, specially prepared and coated with a brownish-black pigment in a fine state of subdivision. Care must be taken in handling it, the fine velvet-like surface being very easily damaged.

Sensitising.

Sensitising must be done by the worker. It is an easy and simple operation, providing the temperature of the sensitising solution and drying room does not exceed 60° Fahr.

The sensitiser is a twenty per cent. solution of bichromate of potash, contained in a dish a little larger than the sheet to be sensitised. All that is necessary is to plunge the paper, carbon side upwards, into this solution, taking care that the whole of the surface is covered as quickly as possible, otherwise small bubbles of air are formed. Should this happen, the paper must be withdrawn, and again plunged under the surface till the bubbles are destroyed. Do not attempt to touch the surface, or the pigment will be removed. After two minutes' immersion, withdraw the paper, and hang it up to dry in a dark room. The bichromate solution may be used several times in succession.

In summer, or during warm weather, add five per cent. to ten per cent. of absolute alcohol to the sensitising bath. This will obviate difficulties caused by a rise of temperature in the drying room, the principal ones perhaps being the disposition of the pigment to leave the surface before drying, and also an exaggerated state of sensitiveness, which prevents any proper judgment being formed as to the time required in printing. By sensitising at night, the tissue will be ready for use in the morning, and will keep for two or three days.

Printing

Printing is as rapid as in the better-known carbon process, and must of necessity be done by an actinometer, because, the surface being black, the amount of light action is not seen. Such actinometers as Burton's, Sawyer's, and Johnson's do admirably for Artigue paper, and about the same time may be given as for an ordinary carbon print, the rapidity being two or three times that of a silver paper. The negatives do not require any preliminary preparation, what is known as a safe-edge in other carbon work not being required.

Developing.

This is done by means of a mixture of a specially ground sawdust mixed with water to the consistency of good pea soup. The proper form of sawdust prepared by Artigue should be used. The print, after it comes from the printing frame, is first immersed in warm water at a temperature of 87° to 90° Fahr., till a silhouetted image appears on the surface. It is now transferred to a dish of cold water for a few seconds, laid on a sheet of plain glass, clamped at one end with a couple of clips, and held vertically over a bowl of the sawdust solution at a temperature of 70° Fahr. The sawdust is poured over the surface of the print, and gradually acts as a very fine file, removing those portions not acted upon by the light. Great command is obtained over the final result by modifying the amount of solution poured on to various portions of the print. From time to time the print may be rinsed in cold water to more closely

examine the state of development; precaution should be taken, however, to develop till considerably lighter than is finally required, as it darkens very much in drying.

After development, the print is allowed to soak in clean water, for about half an hour, to remove the last traces of bichromate salt, and it may then be immersed in a five per cent. alum solution to harden the surface. It is, however, advisable to dry the print before immersion in the alum. If development has not been quite sufficient, it is perfectly easy to further develop till the desired point is reached, after which, the alum bath should be used to fix the surface, and permit of its being trimmed and mounted without damage.

From the foregoing brief remarks it will be recognised that the process is an exceedingly simple one, and only requires such care in manipulation that every good photographer gives to any process. By following these instructions, prints showing all the finest details and gradations of the original negatives will be made, but it will be clearly seen that the process also affords the widest scope for those who believe that a photograph is not artistic unless it gives great play to the imagination.

By means of a brush used judiciously on the surface of the print before immersion in the alum bath, it is quite possible to destroy every vestige of photographic delicacy and detail, if perchance they exist in the negative, and thus render the print, if not a transcript of nature, at least an efficient index of a disordered mind.

A SUBSTITUTE FOR GROUND GLASS IN THE STUDIO.

By Valentine Blanchard.

It frequently happens that the photographer desires to slightly obscure a portion of the studio, and yet does not care to go to the expense of ground glass. To such the following method will be found invaluable. I think in my time I have tried everything for this purpose, and can say emphatically, I only wish I had known of such a plan long ago, for it would have saved me years of worry.

When, some time ago, I saw in a foreign journal linseed oil and tissue paper suggested, I had serious doubts of its efficacy, for I thought the yellow tint of the oil would render the semi-transparent surface too non-actinic for extreme rapidity. I determined, however, to try it before writing about it. A few months ago, therefore, I put the method to the proof, and am so delighted with it, that I give a description of my experiment for the benefit of the reader of these pages. Tissue paper is carefully cut to the exact size of each pane of glass, and is then liberally coated with raw linseed oil. A little excess does not matter, as it is got rid of in the after-process. Before the application, the glass of the studio must be carefully cleaned. On this depends the complete success of the experiment. Now lift the oiled tissue paper and carefully adjust it on the glass. To those accustomed to print mounting little difficulty will be experienced, for it will be found that the oil has made the paper much tougher. Apply a squeegee, and, working from the centre, press out all the superfluous oil to the sides, and wipe it off with a clean rag. Do not

leave off until all the air bubbles are removed. When all the excess of oil has been removed, it will be found that there is not the slightest trace of yellow in the semi-transparent surface, which now resembles very fine ground glass. When it is remembered that sunlight is employed to bleach the oil employed by artists, no after-yellowing of the surface need be feared. Time hardens the oil, and converts it into a varnish. I tried the effect of weather, and found that an outside pane was unaffected by rain, and that it could be sponged to remove smuts without any injury to the surface. Whenever necessary, the paper can be removed by an application of strong soda, when, after a short time, a broad chisel will remove it completely. To those who doubt, I simply say, Try the method, and be convinced.

HYDROQUINONE.

By William Brooks.

I have often been asked for a developer that will give a very intense image with collodio-bromide emulsion for process work, and I find nothing better than hydroquinone; it will give any amount of density with the greatest ease; then, again, for process work, there must be an entire absence of fog. I have found the following to work well, and it can be modified to suit any class of work.

A.

Hydroquinone	60 grains.
Metabisulphite of potash	60 ,,
Potassium bromide	30 ,,
Water	10 ounces.

B.

Common washing soda	1 ounce.
Water	10 ounces.

After exposure the plate is soaked in alcohol in the usual way; the alcohol had better be diluted slightly, so that it may not attack the film. The plate is then well washed until the water flows freely over it, it is then developed in a dish with equal parts of A and B; if the plate is a small one, it can be developed in a dish, but whole-plate size and over can be developed on a pneumatic holder, similar to the ordinary wet-collodion plate. If fogging of the shadows should occur, it can be easily removed afterwards; the fogging generally occurs through over-exposure, *i.e.*, if the emulsion is a free working one. It is as well to allow the developer to act, so as to get as much density as possible. When the development is completed, well wash the plate and fix with cyanide of potassium, which is much cleaner than hypo; the latter is troublesome when intensification is used. After the plate is well washed, possibly the shadows may require clearing out, which I find is generally necessary, and it is best done by an extremely weak solution of perchloride of iron—care must be taken that it is not too strong or the image is weakened very considerably. It will be quite strong enough if the water is of the very palest straw colour; this is poured on and off the plate for about half a minute; the plate is then well washed and the fixing solution (of cyanide potassium) poured over it. It will then be seen that the parts which are to be represented by bare

glass become much brighter by the veil of fog being removed; this can be repeated again and again until all fog is entirely removed. It is then well washed, and allowed to soak for a few minutes in a tray of water; should the image appear not quite intense enough, flood the plate with a very weak solution of iodine. Allow it to act for about half a minute, well wash under the tap, and at once intensify with pyro and silver; by this means perfect opacity can be easily obtained.

Pyro	30 grains.
Citric acid	30 „
Alum	30 „
Water	15 ounces.

Nitrate of silver	20 grains.
Water (distilled)	1 ounce.

Enough of the pyro solution is taken to cover the plate, and a drop or two of the silver solution is added at the time of using; the intensification is best done on a pneumatic holder; when intense enough, the plate is well washed, again flooded with the cyanide, and then finally washed and dried.

THE WASHING OF NEGATIVES.

By M. V. Portman (Port Blair).

I venture to add the following item, gained by practical experience, to the vexed question of how long negatives should be washed, after fixing, to prevent fading?

I am often so situated in the jungle as to be unable to obtain the necessary washing water, and, having had to do without it from necessity, have now discarded it from choice, and thus saved what was formerly a heavy annual loss of negatives from frilling.

My developer is sulpho-pyrogallol, anhydrous monocarbonate of soda, ferrocyanide of potash, bromide of potash.

I do not use any spirits of wine to prevent frilling, and, after rinsing the plate with water twice, leave it for half an hour in the following fixing bath, which need not be freshly made, for it will keep for months: Hyposulphite of soda, sulphite of soda, sulphuric acid, chrome alum, water.

The other day Mr. Donaldson, the editor of the *Journal of the Photographic Society of India*, was here, and I showed him some negatives on Wratten & Wainwright's D. S. P. plates, which were not varnished, were covered with crystals of hyposulphite of soda, and had been lying in a damp climate for six months in that state; yet there was no sign of fading, staining, or spoiling in any way.

We washed these negatives and tested them in different ways, but there was no doubt that they were perfectly good. They had only been rinsed in two changes of water for about a minute after their removal from the fixing bath, and, though I do not advocate the omission of the washing of negatives generally, yet I would bring the glad tidings to those photographers who are so situated that they cannot obtain much water, that there is no fear of unwashed negatives fading in a reasonable period, if they are only *thoroughly fixed*.

A TRADE UNION FOR PHOTOGRAPHIC WORKERS.

By Arthur Field.

Distinct as the ways of our trade have been from the ordinary walks of labour, spasmodic attempts have been made from time to time with a view to utilising the methods of protective organization common to other callings. At different times, and with varying measure of success, employers, workpeople, and dealers have attempted combination for mutual advantage. Our inherent conservatism and our want of business comprehension, perhaps also our artist hatred of restriction, have told against this unity, which could have been of immense benefit. On the workpeople's side of these attempts we early perceive Mr. Redmond Barrett, with a sole view, I believe, to the art side of retouching, attempting to organize retouchers in a kind of guild which should refuse to work for any house not paying a fixed minimum schedule price. This was, I think, early in the eighties. The effort failed from the fact that some of the members broke the mutual agreement of the guild, and the remainder were obliged to fight them on their own ground. Mr. Barrett was not permanently disheartened by the failure, for he was to the front with advice and assistance in the next serious effort for photographic unity.

In the issue of this Almanac for 1890 I laid down the first outline of a trade union for all photographic workers, and, by a correspondence in the trade journals from the latter part of 1889 to the middle of 1890, I followed up the matter as far as one individual could. By July I had gathered together a knot of sympathisers, and after a meeting at the Polytechnic School of Photography I had the advantage of sound advice, several initial errors of tactics and judgment were corrected, and the course made clear. At the commencement of 1891, as things hung fire, we had another and more public meeting at the Polytechnic to send off the Society, and elect a substantial and representative committee. By February the committee had finished its shaping of my draft rules, and in a manifesto which I addressed to the trade in general we appealed to the photographic workers to combine. The history of this appeal, and of our failure, is it not written down in the Almanac for 1894, page 668?

It must not be supposed that we did not make efforts to arrive at our aims by other means, now that the original methods had fallen flat. Mr. W. Goebelhoff, one of the committee, proposed that we should form a social club for assistants, with social gatherings, lectures on photography and the sciences, magic-lantern evenings, &c. By this means we were to secure a membership, and ascertain which of them were ready for business. If we got them together by any means, they would have to listen somehow. Lack of money prevented our giving this plan a trial. Others proposed a photographic guild, to embrace both masters and workers; but, notwithstanding our getting support from some worthy employers of photographic labour, we felt that our having held a brief for the worker precluded the prospect of success for this proposal. I then tried to get some established union, in a similar trade, to admit photographic workers. The Amalgamated Society of Litho Artists, Designers, Writers, Copperplate and Wood-engravers, favourably considered an application made by me with that aim. They gave me a seat at their annual delegate meeting, and my own time to propound my scheme. In the end they decided that they could not venture on

including photographers, because their branch officials had not the knowledge necessary to secure the exclusion of unqualified photographers. After that it was suggested that we inquire into, and if possible join M. Léon Vidal's Photographic Union, founded in Paris. On inquiry this society proved to be a benevolent association for the granting of relief and pensions to members requiring assistance. The membership included amateurs, authors, scientists, and manufacturers, as well as artists, in the photographic 'profession.' We felt the ground was already covered in this direction by the Photographic Benevolent Association. Last, and most practicable of all, a co-operative productive society in photography occupied the attention of my sister and other workers for unity. Over all but the last scheme, and for some time over even that, lay the trail of 'failure.'

For all our failure, I stated that circumstances would ultimately force the assistants to unite for their own protection. It has been weary waiting, but it seems that the year 1896 will have marked the predicted crisis. Our arguments have lain ripening; finally, the necessity for union has forced them into life. In the same way that I was the medium for their first expression, while eventually they evolved into a fuller and completer shape, so now an individual has voiced the new desire for combination in his own way, and the final development taken a different form. Mr. J. A. Randall, after proposing, in the columns of THE BRITISH JOURNAL OF PHOTOGRAPHY, a 'guild of photography' with a broad area of activity, finally restricted himself to raising the old cry for a trade union of photographic workers, illustrating his plea with numerous cases of injustice which called aloud for a means of redress. In the end, this new demand for photographic combination has evolved into a movement for joining an existing trade union which has consented to admit photographers.

Mr. J. A. Randall has focussed his writings on the subject into an ably written and attractive pamphlet, entitled, *The Photographic Worker —Trade Unionism and Co-operation applied to Photography*. As early as April, 1895, Mr. Randall had alluded to my writings in a communication to the JOURNAL; and he then, and at other times, has made it clear that I originated the idea of a photographic trade union, also that he was covering ground already travelled by me in my writings. I should have liked to see this repeated in the pamphlet, but that omission can easily be made good. I shall occupy a little of your valuable space to make clear the remarkable continuity of this movement for unity among photographic workers, and its identity under its various phases and its different spokesmen.

Mr. Randall's pamphlet being a reflex of his utterances elsewhere, twenty-three of its twenty-four pages are occupied with a plea for a Photographic Assistants' Union, while the last deals with the later development of his newspaper correspondence, to wit, the recommendation to photographers to join the Shop Assistants' Union, which has agreed to admit them. It is around the major portion of the pamphlet that our interest chiefly centers, because the joining a union of shop assistants can only be a temporary expedient, either till a photographic union can be formed, or until the other union becomes, by internal alteration, a union of photographic workers collaterally with a union of shop assistants. Besides, the author refers to the National Union of

Shop Assistants as 'working along similar lines' to those laid down in his pamphlet.

I will quote in one column Mr. Randall's scheme as propounded in the pages of his pamphlet; and, in another, our scheme as laid down by me and my colleagues, 1889–91, chiefly in the form of extracts from our rules:

1896.	1890–91.
PHOTOGRAPHIC ASSISTANTS' UNION. All sections of photographic workers, both men and women, will be admitted.	Rule I.: This Society shall be known by the title of The Photographic Artists' and Assistants' Union, and shall embrace workers in all the branches of the art, of all grades, and of both sexes.
OBJECTS.	OBJECTS.
(1.) To provide against want of employment, sickness, and accidents.*	Rule II. (last line): 'To raise funds for the support of members out of employment.'
(2.) To provide legal protection against wrongful dismissal, detainers of specimens, breach of contract, illegal fines.	(Line 23): 'To institute legal proceedings wherever necessary (*a*) against the detainers of assistants' specimens; (*b*) to secure the fulfilment of agreements and contracts with assistants, and the observance of terms of indentures of apprenticeship; (*c*) to secure compliance with the provisions of the Employers' Liability Act, and of *other Acts for the protection of the worker.*' [Of course, including Truck Acts, which regulate *fines.*]
(3.) Trade protection, *i.e.*, to maintain a minimum wage, shorten excessive hours, advocate a weekly half-holiday, †abolish the boarding-in system and Sunday work; to establish a situation register.	(Line 28): 'To attempt the regulation of wages to the following minimum' [here follow details]. (Clause *f*): 'The normal week of labour to be forty-eight hours, overtime to be discountenanced, and, if unavoidable, to be paid for according to the wage received, with the addition of twenty-five per cent.' (Clause *g*): 'A weekly half-holiday from two o'clock, and abolition of Sunday labour. The concession of bank holidays.' (Line 36): 'To establish a registry for the employment of qualified labour at fair rates of wage.'

* We refused, in our 1890–91 scheme, to go in for friendly-society benefits; but I will deal with our reasons later.

† As to the abolition of the boarding-in system, we did not give it consideration; but nothing we said or did would have obstructed any movement for the purpose.

The similarity of the two plans is not confined to the 'objects' merely. I proceed with the body of Mr. Randall's pamphlet:—

1896.	1890–91.
(Page 5): 'Both employer and employed are benefited by maintaining the skill of photographic workers, and it is best achieved by a sound and thorough system of apprenticeship. A badly managed system of apprenticeship opens the door to all those impostors who, for the sake of the premiums, will turn into the labour market badly trained apprentices little better than amateurs.'	(Page 561, ALMANAC, 1890): 'It would regulate the apprenticeship system, rescuing apprentices from that intellectual dark hole, the printing-room.' (Rule II.): 'To secure . . . the observance of terms of indentures of apprenticeship.'
(Page 6): 'There is no reason why women should not receive the same wages as men when engaged on the same work. . . . The fact of their being women is made an excuse for paying lower wages, and is not the result of want of skill. The low wages paid to women is then used as a means of forcing down the wages of men.'	(Page 563, ALMANAC, 1890): 'Women will finally do the work as well as men, and will accept a lower than the average male wage. The male wage will fall as a natural consequence of the competition. That is what the present disorganization of our trade is clearly pointing to, and a Union in photography would solve the problem. It would annihilate the competition by placing all workers of equal merit on an equal footing. Women who possessed all the qualifications necessary for admission to the Union would be admitted and compelled to demand the rate of wages fixed for male workers.'
(Page 11): 'It would be of great service to operators if some scheme could be started by which they could supply themselves with specimens of their work; either by the use of a studio and apparatus, or by paying a certain sum to their employers for a supply.'	(Rule II., clause *d*, *Rules of Employment*): '[A certificate of qualifications and character to be given to every artist or other assistant] together with facilities to obtain specimens from work done.'
(Page 15): 'It would be fairer to have fixed hours of working throughout the year, and a scale of pay for overtime.'	(Rule II., clause *f*): 'The normal week of labour to be forty-eight hours, overtime to be discountenanced, and, if unavoidable, to be paid for according to the wage received, with the addition of twenty-five per cent.'

(Page 15): 'Railway fares ought always to be paid by an employer.'

(Rule II., clause *c*): 'Railway fare of newly engaged assistants to be paid by employers.'

(Page 17): 'Board of Arbitration. That is, a body of photographers who would meet to settle all questions in dispute between employers and employees. Both masters and men would be represented, and they would regulate the various relations with justice to each side.'

(Rule II., clause *e*): 'Each employer, desiring the services of members of this Society, to first agree with them on a local arbitrator in case of trade disputes, and to agree to abide by his decision.'

One might be excused for thinking that there would be some difficulty in showing that the aims and objects of these two campaigns were opposed. Yet Mr. Randall appears to hold that view. He is under the idea that his and my translation of trade unionism are divergent, in fact 'entirely opposed both in aims, and in ways, and means.' It is for us now to consider his grounds for this opinion. He regards our first union proposal as based on the principle of compulsion; on the plan of utilising combination as a means of coercing employers of labour through the strike method; and by preparing (*per contra*) against 'lock-outs.' He regards his scheme, on the other hand, as conciliatory and persuasive; not seeking to extort just demands from unwilling employers, but depending 'entirely on moral forces.' He classifies his methods of obtaining reform thus:—

1. *Legal.*—From Parliament and the Law Courts.
2. *Trade.*—From the enlightenment and generosity of employers.
3. *Provident.*—By mutual assistance among assistants.

Now, I desire to prove that there is no foundation for the idea that the new scheme bases itself on anti-force methods exclusively, or that the old scheme based itself exclusively, or even principally, on force. More than that, I desire to show that both schemes are similar in their essential characteristics, though, of course, not identical in details.

To start with, How can an appeal to past and future legislation for the protection of the worker be squared with moral suasion? Law is force. So far the claim falls flat. Next, how can mutual assistance among members, for provident purposes, be a 'method of obtaining reform?' The provident side of workers' organization can be good or bad; but at its best it cannot have anything to do with reforming the terms of employment. Consequently we can dismiss that, for the moment, from consideration; for we are now seeing how far our two plans of obtaining reforms in working conditions are similar. We come to the third method, the appeal to the enlightenment and generosity of employers to remove grievances and institute improvements, merely remarking, as we pass on, that this is only one part of Mr. Randall's scheme, and that the other part naturally and properly utilises such *force* as is given to the worker by legislation.

Mr. Randall thinks our two plans entirely opposed because he favours provident payments, and appeals to the generosity of employers and the action of the law, while I relied on combative action. Now, it is true that we opposed the management by the Society of sick benefit, as we

thought it would weaken the Society as a protective organization, and also endanger its ability to pay the unemployed benefit. But our plan of unemployed benefit was in itself a 'provident' payment. It was to be paid exactly as Mr. Randall proposed that it should be paid, and exactly as the National Union of Shop Assistants now pays it. Our own rule 16 (*j*) said, 'The Branch Secretary shall at every meeting impress upon the members that trade conflicts and disputes are not to be fomented, but avoided, and specially to point out that, if the funds are absorbed in disputes, they will not be available for benefit.' Of course, it was essential to let the photographic workers understand at the outset that the union was a *trade* union, not existing merely to pay out-of-work benefit. It was necessary at the start to show that a demand for just terms might sometimes produce opposition, and it was also necessary to outline the power of organizations in such a contingency. But, far from this meaning that we intended to fight every one who would not work on our lines, our proposal was as a matter of fact almost identical with the appeal to 'the enlightenment and generosity of employers.' Look at our object, as given in the rules: 'To organize competent labour, and *by co operation with fair employers to obviate all necessity for dealing with unscrupulous employers*, to secure the *support and countenance of employers* in the endeavour to obtain the following "Rules of Employment" for the members of this Society' (here follow the rules I have quoted and several others). This will prove that we appealed to enlightenment and generosity. It was decided by the Committee that there should be no strike pay. In the event of '*extension* of the unemployed benefit to trade disputes,' such disputes would need to be first considered by a branch committee, a branch, a district, and the executive, and were strongly deprecated. Even the pacific Union of Shop Assistants makes arrangements for 'discharge on account of authorised services to the union;' also for the consideration (by committee) of grievances with employers, with power to permit the aggrieved worker to leave employment and receive unemployed benefit. Every union that is a real trade Union has to make provision for trade grievances; but it does not for that reason go in for a 'strike' crusade. In our rules, negotiation and arbitration were to take the place of strikes. Legal action, too (as I have shown in my quotations), was as fully grasped by us, and was to be as fully utilised, as Mr. Randall could desire. The only important difference of the plans was in his plea for sick benefit and our refusal to take over the business of a friendly society. This does not, however, mean the difference between force and moral appeal.

I want here to make a statement, and express a regret. The only time I ever spoke of a fight with employers, a regular campaign on crippling bent, was in a letter to the JOURNAL in December, 1889. Often did I regret it. I was led into it by the letter of some amiable idiot, who asked what we could do if a photographer should dismiss his staff and run his studio with women pupils of six months' standing. Immediately after my angry answer appeared, outlining an impossible scheme of blockade and vengeance, I saw that the very proposals I had made in the ALMANAC for the ensuing year could have afforded the answer. 'His "opposition" would get the best labour, while he would have to content himself with unqualified labour.'

Neither I, nor those who joined with me later, thought it wise to

enter our disclaimers at a critical stage of our movement. But our rules, and our circulars, and subsequent correspondence kept clearly to the lines I have taken up throughout the article. As a heading to one circular we printed our motto: 'Defence, not defiance.' In our 'manifesto' we said: 'While combining for mutual support in time of trouble, we do not propose to enter into any struggle with the employers as a class; in fact, we are confident of securing the co-operation of good employers.'

These facts prove that the movement, under its various phases, has been a continuous and consistent one. There are details in which divergences occur—some unimportant, as where we limited admission to photographers below forty years of age, while the 'National Union of Shop Assistants,' &c., will admit them up to the age limit of fifty years. The new medium of photographic combination grants sick and funeral benefit, and a marriage portion to fair photographers. It is to be hoped that the male members will keep the last-named cash 'in the union.'

At first sight, a 'Union of Shop Assistants, Warehousmen, and Clerks' can be of little use to photographic workers; but Mr. Randall has done valuable work in drawing attention to any society which is willing to accept photographers on an equality with its previous membership. After admission, it will be an easy thing, as the courteous secretary, Mr. Macpherson, has made clear, for a strong section of photographers to make its influence felt. The rules could be amended (by giving proper notice through a branch and convincing the delegates at annual meeting of the necessity) to expand the name of the Society and make provision for exclusively photographic branches. I should certainly advise all photographic workers to join the N.U.S.A.

Mr. Randall has adorned his pamphlet and his newspaper crusade with a number of interesting anecdotes and stories of injustice. I was precluded from this pleasure during my own campaign, for rule-carving and other laborious details forced me to leave the 'tales of a studio' to my friends. I think they told them very forcibly; so has Mr. Randall. We recognised, however, that an appeal to the moral sentiment of apprentice-hunters or 'cheap Johns' was futile. To appeal to the moral sentiment of the general public is equally so, because one cannot get it to sacrifice any advantage or interest gained by dealing with unscrupulous people. But one *can* appeal, and I *do* appeal, to the moral sentiment of the workers in our trade as a whole, and ask them if they think it right to permit wrongs to flourish which they can remove by joining their own forces to those of the wronged in a common combination for defence?

I have here paid tribute to the work of the Committee, who worked up my suggestions into practical form, and did their level best for photographic combination in early times. I will conclude by mentioning them by name: Professor Bolas, Messrs. R. Barrett, H. Snowden Ward, G. Nield, J. Napier, C. Mathews, F. B. Mann, W. Goebelhoff, E. Krauss, A. Anning, Phillips, and Forbes; also Mr. A. M. Henderson of Edinburgh; and to Captain Abney for a kindly and sympathetic letter, which inspired much of our later work. To the memory of the late Mr. J. Traill Taylor the photographic world of workers will ever turn with love and gratitude.

I will conclude with Mr. Snowden Ward's words in the *Practical*

Photographer 'preface' for 1891: 'The same note [Brotherhood] we shall again sound, as clearly as we may, in the hope that many may catch and swell its vibrations until it rings clearly and strongly "down the echoing halls of time." For the good of all is the good of each; and the good of each is the good of all. In the strength of this faith we can defy the world and conquer fate.'

STEREOSCOPIC SIZES.

By J. Leisk.

In considering the above subject, three questions naturally arise; the first is, What are stereoscopic sizes? And, confining the subject to the ordinary refracting stereoscope, the answer is, Plates measure $6\frac{3}{4} \times 3\frac{1}{4}$ inches, and mounts for paper prints $3\frac{1}{2} \times 7$ inches.

The second question is, How have the foregoing come to be adopted as stereoscopic sizes? In reply to which I can only suggest that originally the prints, being limited in width by optical conditions, were cut down in height to make them *square*, and, having once been adopted and adapted for the old-fashioned box form of stereoscope, a wider slide could not be used, while the extra length was necessary to take a hold of when changing the slides, these being inserted from the end of the box.

This brings me to the third question, to which I purpose to devote the substance of my remarks; the question is, Is there any necessity for adhering to the afore-mentioned conventional sizes? And, speaking from considerable experience in practical stereoscopic work, I would say that, subject to certain optical restrictions, there is not.

Any one who has studied the subject from an optical point of view knows that, if the stereo pictures are mounted with a greater distance between the *nearest* objects in the *foreground* than that between the eyes of the observer, there will be felt a difficulty or straining of the eyes in order to make the images coalesce; and this distance has been found by experience to be from $2\frac{3}{4}$ to $2\frac{7}{8}$ inches, which practically limits the width of each picture to that size, or the width of the two combined and mounted with a narrow line between to $5\frac{7}{8}$ inches as the maximum width of the pair when mounted together; hence the extra quarter of an inch which the stock size stereo plate is longer than a half-plate, is not only absolutely useless for pictorial purposes, but prevents their use in an ordinary half-plate dark slide.

The extra length of these plates, however, is a small matter, as they can be cut down to size before using, but what I wish to draw attention to is the absurd and unnecessary limitation in the width of the slide which limits the height of the pictures; for, while the width of the pictures is limited in the manner explained, vertically there is no such limit in theory, but in practice it may be fixed at the effective covering power of the lenses used, and, assuming these to be of 5 to 6 inches focus, the height of each picture would about correspond with the width of a half-plate, and therefore the ordinary half-plate commends itself, not only for making the negative, but as the proper size for making transparencies or prints therefrom.

Any one who has had experience of stereo work knows how important

it is, in the production of a successful slide, to have figures or some other familiar object in the near foreground, in order to give value to the distance, and, if they have attempted it, as I once did, with a camera carrying the conventional size of stereo plates, they will have found the impossibility in many cases of getting the desired amount of the scene within the artificially limited width of plate.

My advice, therefore, to those who are taking up this most interesting branch of photography, is to stick to the half-plates, using a half-plate camera, and mounting the prints on cabinet or half-plate mounts so as to secure, if necessary, all that is contained in the negative, when the increased effectiveness of the slides will fully repay the small extra cost. In passing, I may add that the use of these imply the abolition of the box form of stereoscope, in its present form at any rate; besides, the open or American form is much more convenient for showing paper views.

If transparencies are wanted, they should be made by copying in the camera (full details of which I gave in the ALMANAC for 1892), but on plates 4 × 6½ inches, which can be had to order, coated with 'lantern emulsion,' or, if the worker can use a diamond, half-plate size, transparency plates may be used and cut down to four inches wide when finished, if desired, thus allowing a little latitude for corrections, &c., and, if the pictures be slightly reduced in copying, sufficient margin may be left for the masks and binding without cutting off any part contained in the negative, the pictures, of course, being correctly centered for the stereoscope by having a central division in the front, carrying the copying lenses for varying the distance between the same.

Such transparencies can be produced by copying in the camera more rapidly, and with more certainty, than by contact printing, indeed they give less trouble than the making of paper slides, all the adjustments being made on the focussing screen, after which it is a simple case of exposure and development.

DARK-SLIDE DIFFICULTIES.

By C. H. BOTHAMLEY.

A.—SOME little time ago every one of a set of eight plates, representing a day's exposures, showed, on development, a pair of bands of much lower density than the rest of the image. The two bands were parallel, and ran across the shorter dimension of the plates at a short distance from one end. The edges of the two bands were not sharply defined, and they were separated by a space of about an inch, in which the density of the image was normal. At first sight, of course, it was thought that the defect was due to the hinges of the dark slides, especially as this lot of plates had been exposed at the end of a holiday, and had been left in the slides for some time before being developed. On the other hand, it was known that the maker of the dark slides was particularly careful in selecting the material for the construction of the shutter hinges. Moreover, the strip of material forming the hinge inside the shutter was one strip about one and a half inches broad, whereas the thin bands on the negative were only about three-sixteenths of an inch broad, and there

were two of them. Opinion then changed, and it seemed possible that the bands were due to imperfections in the coating of the plate. Against this view, however, there was the fact that bands arising from faulty coating are generally more opaque than the rest of the negative. Careful measurements were then made of the positions of the bands, and of the various parts of the slide shutter, and at last the cause of the trouble was discovered. The shutters each had a double hinge, the folds being about an inch apart, and it was found that the two bands were the same distance apart, and were also at the same distance from the ends of the slide. The position of the two bands in every case corresponded to the positions of the folds of the hinges. It was then seen that at the folds the varnish, or other preparation, on the surface of the fabric of which the hinge was made, had been worn away, exposing the light-coloured interior portion of the fabric. It was at once clear, therefore, that, although the dark-coloured varnish on the surface of the hinge material prevented the emanation of any vapours injurious to the latent image, where this varnish had worn off along the folds, some gas, or vapour, was emitted from the interior of the fabric, which acted injuriously on the latent image on the exposed plates, and partially destroyed it.

B.—At another time, after developing a number of plates, it was observed that four of them showed a scratch on the film, extending rather more than half way along the plate. It was at first thought that these were due to a particle of grit that had got between the plates when they were packed film to film. Examination showed, however, that only one plate out of each day's work was so scratched, and, further, that it was always Plate No. 4 in the slides. Inspection showed that one of the small screws, which act as stops to prevent the shutter being drawn too far out, had become loosened and turned on one side, and that it was the top of this screw that was doing the mischief. Incidentally this experience indicates the value of taking a note of each plate exposed. Had such notes not been available, the cause of the mischief might have escaped detection for a long time.

ECHOES OF A DECADE.

By Walter A. Locks.

I am afraid the average amateur is too fond of taking things for granted, too prone to regard lightly the conveniences and comforts he enjoys in the pursuit of his art or hobby. The rising generation of photographers do not trouble themselves greatly about the history or the evolution of the modern dry plate; many of them, if they think about it at all, seem to imagine that things were always pretty much the same as they are now.

And yet, if we turn back the pages of photographic history but a single decade, what do we find? Why, even such an article of every day use as gelatino-chloride paper—the favourite P.O.P. of the merest tyro—was entirely unknown. Albumen, that ancient, much-abused medium for positive printing, was then in universal use. Curious that, within ten years of the discovery of its newer rival, albumen should, so far as amateurs are concerned, be relegated to the limbo of forgotten things.

It is less than ten years ago that platinotype came into general use,

Prior to 1889 this paper could only be *used* by special licence from the Company! In the beginning of that year it was announced, as 'a new departure,' that the platinotype paper would, in future, be sold by dealers, that it would be supplied in cut sizes at prices 'to be shortly announced,' and that no licences would in future be required. In 1888 all the photographic world was talking of the new Pizzighelli 'platina direct printing paper,' and great things were predicted for it. Nine years have passed, but it is still unknown to the majority of amateurs.

In 1888, print-out opals were advertised at prices varying from 3*s.* 6*d.* to 5*s.* per dozen, whilst bromide opals were sold at the latter price, or more than three times their present price. Of developers, none of the newer and valuable developing agents, such as metol, amidol, and rodinal, were known. Hydroquinone had come into use, but the favourite developer was pyro and ammonia, whilst photographers of the old school still used the iron developers of their fathers. Wet collodion was still practised by many amateurs, and books of formulæ in those days invariably contained directions for sensitising albumenised paper, quite a large number purchasing the paper unsensitised. Among these formulæ were hints for the prevention of blisters, and the construction of preservative books for keeping the sensitised paper in. It is remarkable how completely the face of the photographic world has changed since then!

Of the men who took a leading part in the scientific and artistic branches of photography a decade ago, many are still with us, though others have either passed away or have given place to the new generation. Ten years ago Mr. H. P. Robinson was still producing his famous story-telling pictures. The influence of Rejlander—but twelve years dead—was still felt in pictorial photography. The late Mr. J. Traill Taylor was at the head of photographic journalism, and Captain Abney was then, as now, manifesting the interest he has always taken in the growth and progress of the scientific side. C. H. Bothamley, W. K. Burton, A. R. Dresser, T. C. Hepworth, J. A. Hodges, F. C. Lambert, Andrew Pringle, H. Sturmey, T. Bolas, and Colonel Gale are still playing their parts in one or other branch of the art, whilst the decade has seen the development into greater prominence of such known men as A. Horsley Hinton, Ralph Robinson, Bernard Alfieri, Lionel C. Bennett, A. H. Blake, Tom Bright, F. P. Cembrano, G. Davison, J. H. Gear, and W. Thomas.

All things considered, the last ten years have been full of importance to the world of photography.

KEEPING PROPERTIES OF CELLULOID FILMS.

By R. P. Drage.

Returning some time ago from a tour to the Far East and back, I was disgusted to find that hundreds of celluloid cut films that I had exposed during my travels were utter failures; all known means of development had been tried, I could get nothing fit to keep. My successful nagatives numbered very few, in despair I gave the matter up, leaving a certain number undeveloped, and did my utmost to forget my bad luck.

Before leaving England, I had taken the opinion of good authorities, who had told me that there was nothing in celluloid more than in glass,

that I should have any anxiety as to the keeping properties of celluloid films, I tested all the brands of films before packing up, and found them perfect in every way.

The various temperatures that these films had to stand during my travels must naturally have had some effect on them, they were in Colombo (one of the hottest places in the world) both going and returning for several days, then a stay of a week in steamy equatorial Singapore, they were stored for three weeks in Hong Kong, before Hong Kong they had been through various extremes, from damp heat, to frost and snow in Japan, after Hong Kong, in Calcutta they were kept with the writer's other baggage in his *tent on the roof of the hotel*, beautifully cool at night, but baking in the daytime; from there they travelled up to the snows of Darjeeling, then through the Indian North-west and down through many changes to Bombay, where, curiously enough, the films and I were again located on an hotel roof (Watson's) for ten days. Then, for the second time, through the Red Sea, stored in bond in the Egyptian Custom House at Ismailia for a fortnight, (in place of paying duty), stored for another ten days at Brindisi, then a coldish journey home by sea *viâ* Gibraltar. So much for the travels and troubles of the films. I may say that in Calcutta I purchased a few dry plates of a well-known English make, and exposed them in Baroda, Jeypore, and Bombay, finding them perfectly satisfactory on development at home in England.

And now, recently coming across that parcel of films (which I had previously thrown on one side in such disgust), for curiosity I exposed a few of them in contact with negatives, the images in all cases, came up bright and clean, in some of them just the ghost of the previous exposure was visible, some showed no trace at all. I then exposed two or three more in the same camera that I had travelled with, and produced perfectly satisfactory negatives, only showing just a trace of the former exposure.

It is thus proved conclusively to me that there is something in the celluloid, which, under trying climatic influences, has a tendency to destroy the latent image, the emulsion itself not appearing to suffer.

In conclusion, should I again take a similiar journey, *I should again take cut films*, for the comfort of travelling with them, as compared with plates, outweighs any possible advantage (*if any*) that plates may have over films.

But (and a very big B, Mr. Editor), I will certainly allow, in future, when on such a journey, *but a very short time* to elapse between *exposure* and *development.*

FADING DUE TO TONING BEFORE FIXING.

By H. S. Starnes.

Many years ago photographers found that they could not tone albumen prints in a satisfactory manner after they had been fixed.

Thus it soon became a general statement in the text-books that it was necessary to tone before fixing, and any other method of working is now often condemned without a thought.

Theoretically, I do not believe (at least with albumen prints) that

this method is correct, and practically, as regards permanence, I have proved it to be wrong.

A piece of albumen sensitised paper contains chloride of silver (which acts the part of an accelerator, beyond that it is of little or no use), an organic silver compound, and a small amount of silver bound up in the film by the coagulation of the albumen, which latter is not removable in the hypo bath, as I showed in some experiments about ten years ago.

We all know that it is necessary to over-print to allow for the after-reduction of the density of the image. This over-printing is mainly a light action upon the silver chloride, and not upon the more slowly acting organic silver compound. But the hypo bath dissolves away the density that this silver chloride gives; and all that the image consists of is a quantity of coloured organic matter, combined with a *very little* metallic silver.

When we put a print in the toning bath the gold will be deposited to a slight extent upon these over-printed tints, which is shown by the blue tint to which subchloride of silver tones. These are, however, apparently removed in the hypo bath, but the protecting gold will prevent the hypo dissolving the whole of this reduced silver produced by the over.printing, and under suitable conditions the sulphur in the atmosphere will soon produce the well-known yellow appearance in the whites of the picture, due to the formation of a sulphide of silver.

A short time since, I was engaged in some experimental work with sulphur tests, and I found that some prints that had been toned first yellowed much worse than those only fixed. So I took two pieces of sensitised albumen paper that had not been exposed to light at all, washed them to remove any soluble compounds. I then soaked one piece in a freshly made borax and gold bath for ten minutes, rinsed it in water, and then put both pieces in separate hypo baths to fix. Both pieces were then well washed and dried.

Under the sulphuretted hydrogen test, while the piece that had been simply fixed and washed had discoloured slightly, the one that had been in the toning bath was very much worse, and had gone to the well-known sickly yellow look of a faded albumen print.

We thus see, by putting prints into a toning bath before fixing them, that the gold assists in preventing the hypo bath removing the whole of the silver from the film, even when it has not been exposed to light. With one exception I am unable to say whether the same rule holds good with gelatine or collodion chloride papers. I tested two pieces of Schölzig's Otto paper at the same time. The sulphuretted hydrogen had no action whatever upon either of them, the paper keeping as white as before they were subjected to the test. There is, however, a singular characteristic about Otto paper in regard to toning that prevents one treating it as a type of a gelatino-chloride paper. For instance, with some samples of water, one can add a grain of gold to a pint of water, and get good tones without any other addition.

I am convinced that the quality of the water used for washing the prints has far more to do with the results obtained than is generally supposed. In some districts one toning bath, or make of paper, will give excellent prints, whereas in other districts the same formula, &c., results in nothing but failures.

A WARNING.

By A. Haddon.

I was recently shown by a photographer some negatives, produced at a Government establishment, where the films were gradually stripping from the glass, and was asked to explain the cause. On inquiring into the method of working, I was told that the plates were developed by means of eikonogen, and, after fixing and washing, were soaked in alum and again washed. The time during which the plates were soaked in the alum was variable, but usually rather long. At once it was evident that the gelatine had been so hardened by the alum that there was no adhesion between it and the glass. Formalin, when applied to a gelatine plate, acts in exactly the same manner, and hence the gelatine can be easily stripped. During warm and dry weather the films crack from their support with a tolerably loud report.

Those photographers who wish to preserve their negatives as long as possible should bear this in mind, and use the alum bath as sparingly as possible; if otherwise, in the course of a few years they will find the bulk of their negatives only worth the glass that supported the films.

THE DARK-ROOM LAMP.

By Arthur H. Pook.

It may interest a few readers of the Almanac to know of a little arrangement of the dark-room lamp that I have found to be of value when developing. I think this may be found useful, more especially to those who, like myself, use isochromatic plates for their work, and which can usually stand only a moderate amount of exposure to dark-room light, even of a 'safe' character. As 'necessity is the mother of invention,' it was when developing these plates that the suggestion that I am about to offer to the readers of this book first came to me. I found that one could not well gauge the density of the plates by transmitted light without the risk of fogging them slightly, that is, I could only hold the plate before the light for a second or so without fear of damaging it a little, and this time is barely long enough for an ordinary worker to gauge density. I therefore arranged the red and yellow fabric screens in front of my lamp, so that at the bottom the medium was, say, only two thicknesses of ruby and one of canary, while the rest of the front was covered with double this thickness. By means of this little arrangement I can examine a portion of my negative that may be of little importance without danger of fogging the more valuable portion, and still have plenty of light to work by. I now use, instead of the usual tin frames of fabric, simply strips nearly twice as long as actually necessary for twice covering the front of the lamp, and double them so that, when slid into the lamp, the narrow part comes to within about half an inch or so of the bottom. This manner of using the fabric loose instead of mounted in frames has also an advantage on the score of economy, as the unmounted fabric can always be very cheaply replaced when soiled or worn out. I have never found any inclination of the fabric to 'buckle,' either inwards or outwards, from the effect of the heat from the oil lamp.

THE POCKET KODAK.

By Joseph H. Woodworth.

Of cameras of all kinds and for every purpose the cry is, 'Still they come.' Not the least in importance, although possibly nearly so in size, is the neat little instrument that supplies my present heading. It has two great advantages, its portability and the ease with which it can be loaded or unloaded 'in the open.' The picture, though small, is usually good, and will make a fair lantern slide by contact printing, and is, of course, suitable for enlargement. I have found it good for interior work, and, if a stereoscopic effect should be desired, it can be easily obtained by taking two negatives, shifting the position of the camera so that the right-hand edge covers the position taken by the left-hand edge at first exposure; or, for instantaneous work, two of the cameras could be placed side by side and the buttons pressed simultaneously. With the prints cut sharply, so as not to show an 'edge,' and mounted on a *dark* cardboard, the effect is very satisfactory.

In developing negatives it is well to do them singly, as, when taken in pairs, variations of light or difference of subject will, of course, affect results.

As trouble often arises from the curling of the films, a simple plan I have adopted will dispose of it. Cut some slips of glass as broad as, and twice as long as, the single negative, and for each slip two narrow pieces of glass corresponding in length with the width of the main slip. When the negative is placed in the centre, and held down by the narrow glasses at each end, secured by indiarubber bands passed round them, the development, fixing, washing, and drying can be comfortably carried out

For printing, the films may be mounted on glass (spoilt lantern squares will be found suitable) by placing them in position and keeping them flat with strips of binding paper, taking care to keep the lines straight. This will enable them to be printed with a white margin of such width as may be desired, adding greatly to the 'finish' of the picture.

DEVELOPMENT OF GELATINO-CHLORIDE PAPERS.

By P. B. Williams.

The development of gelatino-chloride papers is a process which, although it has never become very popular amongst professional photographers, is, nevertheless, useful in dull weather, when a few prints only are required in a limited space of time.

Following the lines on which Eder has worked, I find that gelatino-chloride prints may be developed with an acid solution of pyrogallic acid, a similar solution of metol, and probably other developers of the same nature. This is what has been termed mechanical development. It is caused by the precipitation of silver from the developer on the parts of the paper which have been acted upon by light, the silver in this case being obtained from the free silver in the paper. If the prints be washed

first, no development takes place, because all the free silver is thus removed from the paper; but, if a few drops of silver nitrate are now added to the developing solution, development at once proceeds. This can scarcely be said to be a good method, as the developer generally becomes thick and muddy, owing to the rapid reduction of the silver in it; but it is, nevertheless, interesting as showing the nature of the development.

Quite a different class of developers may be made by using hydroquinone, amidol, metol, or eikonogen, with an alkali and very heavily restrained with bromides of potassium and ammonium.

Prints developed by such developers as these are characteristic in appearance. They are of a pale yellow colour, showing all detail, but wanting in strength and vigour. This, however, is gained in the toning, which may be carried out either in a combined or separate bath. Hydroquinone or amidol used in this manner will be found to give very hard pictures; metol and eikonogen, on the other hand, give very soft, flat pictures. A most satisfactory developer may be made by mixing hydroquinone and metol in the proportion of four-fifths hydroquinone to one-fifth metol. The following formula gives most satisfactory results:—

No. 1.

Hydroquinone	½ ounce.
Sulphite soda	½ ,,
Potassium bromide	1 ,,
Ammonium bromide	2 ounces.
Water	64 ,,

No. 2.

Metol	¼ ounce.
Sulphite soda	¼ ,,
Potassium bromide	½ ,,
Ammonium bromide	1 ,,
Water	32 ounces.

No. 3.

Caustic soda	¼ ounce.
Water	16 ounces.

For use, take of No. 1, 4½ ounces; No. 2, ½ ounce; No. 3, 1 ounce. Prints should not be washed before developing, as this seems favourable to the production of black spots. If the pictures are found to be too hard in quality, more of No. 2 solution should be used, and less of No. 1. A mixture of the bromides of potassium and ammonium in the proportions stated above works better than bromide of potassium or bromide of ammonia alone. The reason of this I cannot explain, and only state it as a fact.

The toning of developed prints take somewhat longer than that of ordinary printed-out pictures. If a combined bath is used, it should be a neutral one, or, if a separate bath is desired, any sulphocyanide formula will be found to work well.

PLATINO MATT BROMIDE PAPER ON TOUR.

By Rev. E. Healy.

At the end of May this year I started for a short outing into Switzerland with a stock of Wellington's platino matt bromide paper and some films. I took no glass, on account of the weight and liability to misfortune. The result has been that I shall bid farewell to films, on account of their spots and scratches, and stick to this paper for general work, keeping a few glass plates for lantern negatives. Out of 120 exposures in my Newman & Guardia camera on the paper, I secured 119 negatives (one being spoilt by an accident in development), which comprised street views, lake and river scenes, as well as snow and cloud effects. My films were not so successful by a long way. The speed of the paper leaves nothing to be desired, as the usual working of my lens was *f*-11 at one-eighth of a second, sometimes one-sixteenth of a second. Once or twice in shaded lanes I gave two seconds. There is no trouble in developing, the negative comes up, with clear, white edges, in about two or three minutes. One drawback there is, I cannot make lantern slides from them. The grain will show, even when printed on the quickest plates I can get. Now, when printed on the same paper as the negatives themselves are on, I will defy any one to detect, in most cases, any grain at all in the prints unless very minutely inspected. My experience of this paper is that it is preferable to the special negative paper sent out by Mr. Wellington, as the colour and density of the negative is better, and the thickness makes it more handy for use in the sheaths. For larger work, as whole-plate or 10 × 8, it is simply perfect. I had been cherishing some old negative paper, but I can now let that go, and use in comfort and certainty (as I would advise all brother photographers to do) this bromide paper for negative work, especially for the hand camera, as excellent enlargements can be made on a slightly rougher paper.

HOW I LIGHT MY DARK ROOM.

By R. J. Latham.

Having to discontinue using my old developing room, owing to the want of an extra bedroom, I had to adapt one that is used as stock and general box room, and, as it was still required for those purposes, I could not do with the window blocked up permanently; I therefore had a board made to entirely cover the window. The side next the window I covered with American flexible cloth by glueing it to the face; which serves two purposes, it looks neater from the outside than bare wood, and also, if the sun causes the wood to crack, it excludes white light. This I found was rather a bother, taking out of place each time any of the stock was wanted, so I had a piece of ruby glass framed and let into the centre and the board sawn across just above the frame, a couple of hinges put on, and the joint covered on the inside by tacking on a strip of cloth. It is now quite easy just to pull down the flap thus made of the top third, which is the depth of the top row of panes, and have white light directly, the bottom portion being screwed to the window frame, the flap is very soon closed when wanted for development or changing plates.

HALF-TONE DIRECT FROM LIFE AND NATURE BY A SIMPLIFIED PROCESS.

By A. Mann.

Hitherto the belief has been generally entertained that it would be impossible to make screen negatives direct from life in portraiture, chiefly on account of the length of exposure required in the camera, and this is quite correct when the operator is working in the usual way with the ordinary cross-line screen, the necessary exposure of from fifteen minutes up to an hour being far too much for even the most patient of sitters. With a different form of screen, however, wrought upon a different principle, the exposure can be reduced to a very small fraction of what is necessary with the cross-line screen. With rapid screens of my own making, which I have been supplying to the public for some time past, I find I can produce half-tone negatives direct from life on gelatine dry plates by an exposure of from one to three seconds in the house in a fairly good light. With such an exposure I see nothing to prevent portrait photographers from making screen negatives direct from their sitters, and either doing the etching themselves or sending it out to the photo-etchers, just as many firms now send out their negatives to the trade printers. They could then supply their customers with proofs in permanent printing ink by the hundred at a trifling cost, and the public would have an admirable opportunity of filling scrap albums with portraits of their friends, and a boundless new field would be opened up for the photo-etcher. Space does not permit here of my entering minutely into details or theoretical considerations; but I may indicate briefly the principles upon which my mode of working is based.

What chiefly handicaps the process worker in the ordinary orthodox way is the narrow limits within which he is restricted in the size of the diaphragms used; and this, in turn, is caused by the necessity of working the cross-line screen at some distance in front of the sensitive plate—a distance which varies with circumstances, and is by no means easy to hit upon. In fact, the proper adjustment of the screen and manipulation of the stops, to suit the character of the subject and scale of reproduction, form quite a complicated problem, which the operator has to solve for himself in each case, and the striking inequality of the work turned out by many firms shows, but too plainly, that in many cases he fails to solve it correctly, and that some simpler mode of working is still much needed.

Then, again, if the cross-line screen be placed too near or close to the surface of the sensitive plate, it produces the very worst form of grain for etching and printing purposes. It will be evident, therefore, that before we can produce rapid work we must dispense with the crossline screen, and substitute for it a form of screen which will admit of being placed near to, or close upon, the plate, and which will produce a form of grain suitable for etching and printing purposes, and also give sufficient gradation and contrast to the picture, and such screens can now be produced.

By this mode of working all restrictions as to the use of diaphragms are got rid of; which opens up great possibilities for half-tone work. Expensive long-focus lenses and large process cameras with delicate

screen adjustments are no longer essentially necessary; successful work can be done with any kind of camera, and any kind of lens that will take an ordinary photograph. The amateur who may wish to try his hand at half-tone need seek nothing better than an ordinary tourists' camera and double dark slide. The screen is first inserted in the dark slide, and then the plate put against it, and the blackened cardboard division put behind the plate, if necessary, to keep all tight. After focussing, some small allowance has to be made for the displacement of the plate caused by the screen, by racking forward the back of the camera a distance nearly equal to the amount of the displacement, which is very easily done. The exposure is made in the usual way, about four times as long being given as would be necessary without the screen. The contrast and gradation can be modified to a considerable extent, if necessary, during development, especially if pyro be used.

The first form of screen which I used for rapid working from the life several years ago was of a chessboard pattern, which gave very good results in the high lights and half-tones when used in contact, but did not give so satisfactory a rendering of the shadows.

It has been reported of late that this form of screen has been patented by the Surveyor-General of Canada; but, if so, the patent cannot be of much value in this country, since we have been making and using chessboard screens down here in Edinburgh for the last seven years. I find, however, that a modification gives better results than the true chessboard pattern.

My more recent screen negatives from life have been done mostly on Ilford special rapid (red label) plates, and with the full aperture of an ordinary cabinet portrait lens working at *f*-4, which admits about thirty times as much light as would have been available with a line screen in the same circumstances, the time of exposure averaging about two seconds. With Ilford ordinary plates, from six to eight seconds would have been required, and about one minute with process plates. I have been badly handicapped here for want of proper light for portrait work, as, my place of business being situated in Waterloo-place, where the architecture is classic in style, the civic authorities would not for a moment think of permitting any glass structure on the roof.

In conclusion, the advantages attending this mode of working may be thus briefly summed up:—

1. Any size of diaphragm can be used, from a mere pinhole up to the full aperture of a rapid portrait lens, thus permitting of a small stop being used when necessary to correct curvature of field or secure depth of focus, or a large stop to save time or compensate for feeble light.

2. Less care and skill are necessary in fixing the position of the screen, as it may be simply put against the dry plate, the requisite contrast being secured by the structure of the screen mesh and mode of development.

3. In working wet plates, the same latitude in the position of the screen permits the back of the wet plate to be put next the screen, which forms a convenient method of reversing the negative and also of preventing the condensation of moisture on the screen—a frequent source of failure and annoyance in cold weather.

4. Any ordinary dry-plate camera may be used, and any lens capable of making a satisfactory photograph in the ordinary way. Even wide-

angle lenses may be used. I find that a block, eight inches by six, can be made with a wide-angle lens of only six inches equivalent focus with satisfactory definition up to the corners.

5. Screen negatives can be made direct from life and landscape from nature, as the requisite stops can be used to suit both purposes.

6. Whereas a certain intensity of light is absolutely necessary for the production of screen negatives by a line screen; by this mode of working want of intensity can be compensated for by increased time of exposure or the use of a larger stop.

7. Much more sensitive plates or films can be used, as there is much less risk of light getting diffused between screen and plate, to cause fogging.

8. Thin films, which are so troublesome to work with the ordinary line screen, are easily managed by this method of working. A piece of any size or shape has only to be pressed up against the back of the screen with some suitable pad, no carrier of any kind being necessary, and when developed can be printed from either side, and all bother with reversing saved.

9. Owing to the large amount of light available by this method, the picture may be photographed on to the metal direct from the original negative, and both the ordinary photographic print and screen negative dispensed with, and the consequent loss of detail caused by these two operations prevented.

10. A great saving of time may be effected by any operator who is not provided with electric light. He may adjust his subjects and expose quite a number of plates during the two or three hours of suitable daylight in winter, and then develop them later in the afternoon. He could, in this way, produce more negatives in one day than he could in a whole week, working in the ordinary way with wet collodion and line screen.

11. Where artificial light is wanted, the large diaphragm available will enable the operator to produce satisfactory work with a much weaker light than is usually found necessary. An installation of incandescent gas on the Welsbach system, which could be got up for two or three pounds, and would cost about three farthings an hour, would be found to answer his purposes sufficiently well for negative-making.

CAEN AHOY!

By W. F. Field.

Let me confess it. For eleven months of the year I had been pining for a laze in Lazyland. There are folk who will button-hole you in the street and declare that holiday tours are demoralising; that they unfit one for work; that they are the source of evil, and that some day—but why repeat it all? Doubtless you, kind reader, have experienced it, and still we pine for that brief respite from the dreary, prosaic, daily round.

This year I was anxious to explore a new region, but a library of guide-books, a host of holiday literature, only added to my dilemma. It is always thus. Where to go? is a problem that besets more than one of us.

Finally I fixed on Caen. At present this delightful little French town

has hardly received the patronage that it deserves, which is so much the better for the tourist. Taking with me a half-plate camera and a small Kodak, I started one afternoon in the autumn. The London, Brighton, and South Coast Railway has wisely opened up this branch of their traffic, and in a few years, doubtless, it will be overwhelmed with photographic globe-trotters. The fares are inexpensive, the journey a short one, and the boats splendidly equipped Getting down to Newhaven in the afternoon, we have time to snatch a few views of the harbour and shipping, and then we leave our pet pastime for the nonce, and make the acquaintance of the good steward.

Early next morning we sight the chief town of Calvados; a run up the canal occupies a few hours, and we alight at the quay. M. le Douannier nods approval as we whisper, 'Photographie, m'sieu,' and we make our way to the hotel prior to prospecting round. Once in Caen, there is a fine field for the exercise of our pastime.

Yonder is St. Pierre, with its grand exterior; and there, too, is the Castle. The guide will tell you, smilingly, that the English flag once waved from its ruined turret—the information is priced at a franc! Near, too, is the Hôtel Dieu, founded by the good nuns of Trinity—'ministering angels' every one of them. There is a fine view to be had of the distant towers of St. Etienne, and the Abbaye aux Hommes is worth the expenditure of a plate or two. Leaving the camera with the custodian, an hour is pleasantly spent in the Musée, containing a Murillo, a Van Dyck, and a Sassoferrato, each of them gems in their way. In the narrow byways there are endless views to be had—quaint, picturesque, and pretty.

Perhaps there is a little too much William the Conqueror about the place, but we can forgive all this. Charlotte Corday owned Caen as her birthplace, a fact alone that should render it famous. But I have already transgressed; space in the ALMANAC is valuable, and therefore it behoves me, in stage parlance, to 'ring down.' But do go to Caen; you will like it.

AN INDIAN MATTER.

By H. HANDS (Jubbulpore).

AMATEUR photographers in India, of whom there are a constantly increasing number, greatly feel the want of that mutual help that their brethren at home derive from their local societies, more especially in the elucidation of those small but annoying pitfalls that await upon the amateur in the beginning of his practice. Being scattered over a vast extent of country, it is simply impossible to benefit by joining one of our two Societies. Their usefulness, if such a term can be used in connexion with them, is confined to those members who reside in the towns that own them. The vast majority who live in the mofussil are absolutely unbenefited by their existence. Those who do join confer a benefit upon the Society to the extent of their subscription, for which all they get is a copy of the Society's journal, which is expensive at just under one rupee per copy. It contains little original matter that can be said to be helpful to the majority, who cannot be said to be expert

photographers. Its contents are mostly extracts from English photographic literature, and readers would be better off considerably by buying two or three of the latter. For instance, we can buy a mine of photographic wealth for the price of one copy of an Indian journal in the shape of this ALMANAC. Of the usefulness of such books all over the world there can be no two opinions.

Some time ago I was paying a visit to a small station in a district that but a few years ago was infested by Dacoits, 'twas so wild. As is my wont, I dived into the innermost depths of the native town with my hand camera fully charged. During my wanderings I saw what, to my astonishment, looked like a studio tent, though of an extraordinary shape, standing outside a row of squalid houses. I unhesitatingly made my way over to some men sitting about, and made inquiries.

It happened that the 'Fuzzee-wallah' was amongst them, and I entered into conversation with him—on our art, of course. With the native the greatest picture is a 'Fuzzee,' so also is a photograph. Here, at least, our works receive their due, and take proper rank! Don't mistake this for a joke. Well, to return: I went into his house by invitation (I will not say I did not fish for it), and it was a revelation, I assure you. There was no room to turn around in the ordinary way; one had to come about on the heels as soldiers do in the ranks. The arrangements for washing plates and prints, as well as those for all other manipulations, would make the most careless or hard-pushed English amateur shudder. That the man was, according to his light, careful and painstaking was evident. He could speak and read English, and had upon his shelf the latest BRITISH JOURNAL PHOTOGRAPHIC ALMANAC, which had every appearance of being well thumbed. Truly, this bulky educator finds its way into some queer corners of the globe! I expect one will be found at the Pole, not in the hands of the Scotchman who will be found sitting thereon, but as the companion of the Esquimaux photographer.

The way in which this man appreciated his shilling's worth of information as represented by the ALMANAC is an indication of what is required. We want a journal the greater part of which must be devoted to every-day practice, and attention to those helpful (if to the advanced worker insignificant) details that every beginner must assimilate before he is able to get full value out of the higher literature. Why harry his brain with long articles on the higher orthochromatics, translated from pedantic German, while he searches his back numbers in a vain endeavour to discover a clue as to why the plate he has exposed miles away, and carried with a sinking sensation under a blazing sun, should hopelessly fog as he pours on the developer? Had his journal devoted itself, as it should do, to teaching how photography should be practised in India as distinguished from its practice in England, that poor fellow would have been aware that a thin leather or canvas bag is insufficient to keep out the ardent rays of an Indian sun. As it is, he thought that, since the maker (one with a reputation) had put the kit upon the market, it must necessarily be efficient, and that there was no pitfall to be feared as far as his apparatus was concerned. It naturally would never occur to him that the manufacturer had never probably walked for a few hours under the burning rays of King Sol, as we know him. Now, in his difficulty, he ought, at least, to have been able to turn to his back numbers, and, under the heading of 'Apparatus' in the index, have found an entry something

like this: 'Precautions against the Sun, p. —,' and, on turning over to the reference, have found: 'Never expose your camera bag unprotected to the sun. If weight is a consideration, and a thick wooden box an impossibility, the best thing is a tin case made to take the kit, having ribs inside and holes top and bottom for circulation of air.' Had he found this he would have been able to eliminate one fruitful source of fog, and have learnt a valuable lesson; but no, even an accomplished editor can do nothing where the printers are masters.

What we want is a journal run *by* Indian photographers *for* Indian photographers, and dealing primarily with the peculiar conditions of the country, in which every subscriber would record his failures and the conditions attending those failures. The answers sure to be forthcomiug in a great number of cases would make a complete and valuable reference for others, *if properly indexed*, for all time, with regard to the particular matters they concerned. In this way would grow a valuable volume of reference concerning the practice of photography in India. As regards the *generally applicable* practice of photography, new developments of the same, and matters of general interest, such a publication as The British Journal of Photography would meet every requirement, since there is little of value that it misses. And perhaps the same may be said of other excellent and *medium*-priced journals. Failing such a departure as I suggest, if this article is the means of stimulating our existing papers to a consideration of our real requirements, it will not have been written in vain, I think. In the direction indicated, unhampered by clique interests, lies abundant usefulness.

REMOVAL OF GREEN FOG AND SURFACE MARKINGS.

By Henry W. Bennett, F.R.P.S.

It occasionally happens with some plates when developed with pyro-ammonia, if development is at all prolonged, either from the character of the subject, or the exposure having been rather too short, that green fog will make its appearance and seriously detract from the quality of the negative. With one brand of plates that occasionally have this defect, I have found that it can very readily be removed either immediately after fixing and washing, or at any time later, by intensifying with mercury and sodium sulphite; the improvement in quality being very decided. When green fog is present it is strongest in the deepest shadows, and consequently the printing value of the shadow detail is considerably lessened, and in addition, most negatives that have this defect suffer from being somewhat thin. In brightening up the shadows by the removal of the fog and the simultaneous strengthening of the shadow detail by the intensification, the details are relatively considerably strengthened, while the extreme points of shadow print darker than originally, the whole negative being greatly improved in quality.

Another defect that sometimes results from forcing with ammonia or prolonged development of plates that have been kept, is that of surface markings, the most troublesome being iridescent, either round the edges of the plate only, or occasionally in patches extending almost over its entire surface. These can be removed in a few seconds by the application

of Mr. Howard Farmer's reducing solution. It should be very much weaker than would be used for actual reducing, a good strength being

Hyposulphite of soda	¼ ounce.
Water	4 ounces.
Potassium ferricyanide	½ to 1 grain.

That is, five to ten minims of a ten per cent. solution.

If the markings are slight, a solution of this strength will readily remove them, but when a plate is very badly marked it may be necessary to use more ferricyanide; in any case, the negative will not be injured if it is carefully watched and removed from the solution as soon as the surface appears clean and free from stains, that is before any reducin action has taken place.

VERY MYSTERIOUS RAYS.

By J. Dormer.

I used to think that the humorous weekly journals possessed a certain educational value, somewhat on the principle of letting us see ourselves as 'ithers' may see us. The intensity of my faith in this idea has greatly increased of late. I have been reading some of the jokes on the X rays. It seems strange to me that experimentalists disregard the grand discoveries so freely discoursed on and jested about in these journals. Surely, it is pushing scientific etiquette too far to allow these discoveries to remain for so long a time the monopoly of such papers. I will mention two or three of the results already attained that may be new to the readers of The British Journal Almanac. Details, being hardly susceptible of humorous treatment, are habitually omitted in these papers, but doubtless the editors would supply them if courteously approached.

Firstly, then, savants seem to ignore the fact that it is possible to take photographs by the Röntgen rays in an ordinary camera and through the ordinary lens. You direct your camera, as usual, towards the sitter, preferably in broad daylight, and take his skeleton with a rapid drop-shutter exposure. Prints are given of a complete human anatomy, taken in this way, on a single plate (brand not mentioned). This alone is a great advance on the cumbrous methods used in our laboratories.

Secondly, there appears to be a Kodak manufactured 'with cathode of Geissler tubes attachment' (I am not quite sure I understand this phrase, so I copy it *verbatim*). It must be a terrible instrument! For instance, I find that a young man discovers, on taking a surreptitious snap-shot of his girl, that she suffers from 'ossification of the heart' (a very painful disease, I should imagine). Of course, he wishes to break off the engagement between them. Whether, ethically speaking, this was justifiable, I do not feel inclined to debate.

Again, with (I suppose) the same pattern Kodak, one may obtain ocular evidence of the existence of a five-dollar bill snugly ensconced in its owner's pocket. Of course, this is disheartening when the owner of the Kodak makes use of his opportunities in seeking a small loan and proclaims the presence of that bill in your pocket. If we are compelled to

become so odiously truthful, will life be worth living? I really have doubts on the subject.

There is no difficulty in gaining an idea of the apparatus used. One meets with sketches at every turn. The predominant form resembles closely an ordinary hand camera, having a small electric light affixed to it. These cameras no longer take merely shadows, they photograph superficies. The photographs are clearly obtained by the reflection of the X rays from the surface of the subject. This is a very interesting fact, having regard to the instantaneous exposure. I trust the method of so doing will soon be published—that is to say, if it has not been already done.

Lastly, I should like to warn persons who dislike their domestic arrangements to become publicly known that caution is now requisite. These journals show that burglars may see what cash there is in the safe before commencing to break into the house. And, worse still, Paul Prys are even said to take family groups unsuspectingly seated around their own hearth, through the walls of their dwelling, during the ubiquitous wanderings in which gentlemen of this patronymic are inclined to indulge. We have an appalling future before us, if experimentalists refuse to step forward and tell us how to counteract the malevolent influences of these very mysterious rays.

P.S.—I was not born in Scotland.

STAINS DUE TO INTENSIFICATION.

By Arthur H. Starnes.

Most of us who have had any experience with the intensification of negatives with mercury and ammonia know how difficult it often is to avoid yellow stains. It is doubtful whether this is entirely due to hypo being left in the film, and forming a sulphur compound with the mercuric chloride.

When a plate is put in the mercury bath, a precipitate is deposited on the surface of the film, in addition to that on the silver image. Ordinary washing often fails to remove this. I find that, by gently rubbing the surface of the negative with a plug of cotton-wool during the washing previous to the ammonia bath, this precipitate is removed, and the plate is not so liable to stain.

In these days of very rapid plates, green fog is a very common evil. A good plan to remove this is to develop the negative rather strongly, and then to put it in an ordinary ferridcyanide of potash and hypo reducing bath. This nips off the green fog directly, and, if the negative is then removed from the bath, no noticeable reduction in density will be found.

SODIUM SULPHITE.

By T. W. Derrington.

In making up developers in solution, especially the modern ones—metol, amidol, &c.,—where the sodium sulphite plays such an important part in

the developing power, the writer would strongly advise the use of the 'pure' sodium sulphite, not the commercial salt. See also, in getting it, that the crystals are clean and transparent, and not covered with a white powder, which indicates that the salt has been partially oxidised by the action of the air to sodium sulphate, and which is useless, if not actually deleterious, in the developer, besides reducing the actual weight of sulphite apparently taken. If crystals in this condition have to be used, they should be washed with cold water and placed upon clean blotting-paper to drain; then weigh out the quantity required after draining.

The commercial salt is frequently so very impure being the reason why the pure salt is recommended.

LANTERN SLIDES: A PAPER FOR AMATEURS.

By William Ouin.

Now that we are fairly into the long evenings, I do not know of anything more interesting to the lover of photography than lantern-slide making. It is always a source of great pleasure, besides being instructive from a technical point of view, and the amateur photographer ought to be a student willing to learn; for it is by thus studying, dry as it may sometimes appear, that knowledge is gained, and we are better fitted to help and teach others, so as to lift them out of their difficulties, and create in them the desire to do something which hitherto they have been unable to accomplish. To this end *perseverance* is an important factor not to be disregarded. How many fail because they do not persevere? Then there is the educational side of the matter, and a very important one, too. Doubtless there is no better way of illustrating a lecture than by the lantern and photographic slides, for these, if well executed, are more real to the audience than the old painted slides, valuable as they were in their day, because the photograph is able to give minuter and more faithful detail than it is possible to put in a slide drawn and painted by hand.

Having said so much by way of introduction, let me at once proceed with the operative part of my subject. You have, doubtless, got a good store of negatives by you—select from these your best. Those that are sharp and full of detail, and not too dark in the shadows, will make the best slides. If your negatives are all quarter-plate, you will doubtless, without much trouble, be able to make them at once by contact-printing; but, if larger, then they will need to be reduced to the ordinary lantern size, suitable for printing direct by contact. At a small cost you can obtain a printing frame, just the size and suitable for this particular work, which is much better than adapting a larger one, although of course you can very well utilise your quarter-plate frame if necessary.

The next consideration is the light to be used in printing; well, to my mind, that given by an ordinary paraffin lamp is best, and I would advise the use of one that has a glass chimney partly ground. I consider this the best, as it gives a softer light, and you will find that from nine to twelve inches from it is sufficient, according to the density of the negative you are printing your slide from. I have also obtained very good results from magnesium wire. Take, say, a foot of wire, cut it up into twelve pieces of one inch each, using one piece for

each exposure, at a distance of about three feet. In some cases, where the negative is rather thin, it will be found that three-quarters of an inch will suffice, or even a little less.

Having exposed the plate, you proceed to develop it. Now, there are several developers in the market; and, although each maker, as a rule, advocates one, as specially suitable for his plate, it will be found that a good *standard* developer will develop most brands of plates. Still, we have our own pet developers, and I must confess that to my mind the *hydroquinone* developer is the best, because it allows a greater latitude in exposure, and it is much cleaner, as it does not stain the hands. Here is the formulæ for Hydroquinone and Pyro :—

A.

Hydroquinone	160 grains.
Soda sulphite	2 ounces.
Bromide of potassium	30 grains.
Water	20 ounces.

B.

Sodium hydrate	160 grains.
Water	20 ounces.

Take equal parts of each.

No. 1 Solution.

Pyro	$\frac{1}{4}$ ounce.
Soda sulphite	1 ,,
Water	20 ounces.

No. 2 Solution.

Carbonate of ammonia	225 grains.
Potass hydrate	188 ,,
Bromide of ammonia	150 ,,
Water	20 ounces.

Take equal parts of No. 1 and No. 2 solutions. Development will take from two to three minutes.

I would, however, recommend the amateur to try two or three, and the one he succeeds best with, to keep to that one, and practise with it till he becomes master of it. The remaining manipulations are fixing in a bath of hyposulphite of soda and then thoroughly washing in several changes of water. You then place the slide in a rack to dry, or in a place suitable for standing them *free from dust*.

But I cannot conclude this paper without referring to the method of making slides direct from large negatives. This is done by a camera specially made for the purpose, and such a camera can be purchased. If you make lantern slides a hobby, it would be well worth your while to obtain one, either from a maker or a dealer who may supply them, as, of course, it would save you the trouble and expense of first making small negatives, and then printing from them by contact.

It will, of course, need some practice and patience too on your part; but in a very short time you will find it become not only easy to manipu-

late, but a pleasure, and as you advance in the study, so it will become more and more interesting to you. I need scarcely add that, whether you make your slides by the first method, or by the reducing camera, the after manipulations of developing, washing, &c., will be the same precisely.

STEREOSCOPIC EFFECTS WITHOUT THE STEREOSCOPE.

By J. F. Hammond.

Everybody, more or less, can squint, *i.e.*, make the two eyes diverge towards the same point, which is generally the tip of the nose. Well, this same method, applied in a slightly different direction, such as that of squinting at a stereoscopic slide, will be the means of the beholder seeing the subject of such standing out in bold relief, only at a slightly less magnification than in the ordinary stereoscope.

Further, by the interposition of a magnifying glass, which, in this case, should be equal in diameter to the length of the slide, a magnified stereoscopic effect is obtained. Try it, for a little practice will prove that one may be independent of the stereoscope!

HOW TO FIND NEGATIVES.

By Ernest C. Fincham.

Much time is lost, and patience expended, in what is very often a futile search for some particular negative.

Perhaps an hour, or even more, is wasted by hunting through two or three hundred of one's photographic successes and failures. To obviate this expenditure of time, one would like to suggest a method of indexing that the writer has found very useful.

The pecuniary outlay for the necessary materials is trifling, and is covered by a few pence. Two note books, indexed, are all that one requires. The one contains a numerical, the other an alphabetical, index.

Empty plate boxes are used for storage purposes. Every box should have a gummed label affixed upon the side of the box, each label bearing its own distinctive number. Plate boxes when filled may be kept ranged on a shelf like so many books. A system of double indexing is used. The numbers, 1, 2, 3, &c., refer to the boxes; under the alphabetical headings are found the titles or subjects of the various pictures. A concrete example will perhaps make my explanation more lucid.

One wishes to find a negative exposed, let us say, in Guernsey. Reference to the letter G in the alphabetical index, shows one that *Mail-boat Approaching Guernsey*, 6.30 *a.m.*, is stored in Box 12. By adopting this method, much time and temper are saved.

IN EXTREMIS!

By John Dormer.

A friend of ours has sent us a letter detailing his parlous state. As it may serve as a warning to others, we append an extract.

'. . . . *I* think it shamefully unfair.

'*She*, however, says that "in war and love——" But let me tell you the facts.

'I am a middle-aged bachelor, in comfortable circumstances, as you know.

'I don't want to marry.

'Marriage! Good heavens! My blood runs cold at the thought of it. I am most agitated—quite flabbergasted, so to speak. She actually says that, if I don't—— It's positively appalling!

'*You* know her, my friend. She is Mima Brown—Professor Brown's daughter—a little *passée*—strong-minded.

'I can't write coherently.

'If you glance at any of the scientific journals, you must be aware that Professor Brown's X-ray apparatus is justly famous for its power and completeness. His immense fluorescent screen created a sensation at the Royal Society's last *conversazione*.

'*She*, you know, has him in complete subjection. I believe he has put on flesh the last few days. Can it be in anticipation of his approaching freedom? Pity me, old chap.

'I went to call on them last week. The fluorescent screen, I noticed, was in the hall, also a camera. I went into the morning-room, suspecting nothing. The hall wall is also the right-hand wall of this room. The opposite wall is also that of his laboratory. . . .

'How could I guess that a powerful X-ray tube was at work there? He can, you know, make the screen fluoresce thirty feet away from the tube . . . . and through walls . . . . and photograph the image on the screen. . . .

'I thought *she* was very—affectionate. I—well, I was not baptized Joseph. . . .

'She threatens to produce the photographs, or shadowgraphs, or whatever they are.

'What *am* I to do?

'Advise me, for heaven's sake.—Yours miserably, 'C. de V.

'P.S.—I have just learnt that Professor Brown was undoubtedly lecturing somewhere in the Midlands on the afternoon I called. Can it be that she is playing a game of bluff? Oh! if only——'

DRAMATISTS' PHOTOGRAPHY.

By T. C. Hepworth, F.C.S.

It is quite natural that the mysteries of photography should occasionally be utilised by those who write plays, as a means of working out their plots. It is also natural that some of these writers should be so ignorant of the actual conditions under which a photograph is produced

that they should occasionally fall into grievous error. For your playwright, and your novelist too, is so taken up with his grasp of an idea that, in his working out thereof, small details escape notice. Perhaps the most flagrant instance of impossible photography is that which occurs in Boucicault's play, *The Octoroon;* but it is more excusable than later sins of the same kind, for the play was written about thirty years ago, when the amateur, as we know him now, was unborn, and when, therefore, the spread of photographic knowledge, such as it is, had not yet taken place.

In Boucicault's play—we are writing from memory—the scene in which the photographic episode occurs is in the backwoods of America. A little slave boy, who has the care of a bag of letters much wanted by the villain of the piece, is left in temporary charge of a camera, and, as he wants his own portrait taken, he instructs a friendly nigger to uncap the lens, and to run to a certain point and back before recapping it, so as to allow time for the necessary exposure. Although the wet process was the only one available, there was no tent, bottles, or other appurtenances. The dramatist simply waived them; probably he did not know that they were necessary. But to resume our story. While the nigger is absent, the villain enters to slow music, brains the boy, steals the letters, and, with a 'Ha! ha! they are mine,' sneaks off into the adjacent jungle. Presently the nigger returns, and weeps abundantly when he finds the poor boy minus what little brains he originally possessed. Then, looking round, he thinks he recognises in the camera and its tripod the cause of the tragedy, and smashes it to pieces with an axe. The innocent camera is thus knocked inside out, and is spread in sections over the stage. After a few minutes the good young hero enters, and, after hearing the story from the nigger, examines the *débris* of the photographic apparatus. He is suddenly struck with a happy thought. He takes up the sensitive plate—which, being of glass, of course escapes the general smash—sees on it the photograph of the murderer in the act of braining the boy. The murderer is tracked and sent to the gallows. As the plate has never seen a silver bath, of course it did not require development—and there you are, don't you know!

Then, about three years ago, there was another play produced in London, in which the hand camera was in constant evidence, and was used as evidence, too, of certain acts performed by the *dramatis personæ*. It was used for taking snap-shots in gas-lit rooms, and in all sorts of impossible ways. The writer of the play had evidently the most rudimentary knowledge of photography, and had gathered what little he had from the various skilfully constructed anecdotes as to the marvels of detective cameras, which occasionally go the round of the London and provincial journals.

The latest instance of dramatists' photography is afforded by Mr. Jerome K. Jerome's recent play at the Garrick Theatre, *The Rise of Dick Halward*. In this case the entire plot turns upon a photographic incident, which we fear we must number among things impossible. Here is the story in brief. The hero, Dick—a briefless barrister—is in love with a heartless flirt, who says she cannot think of marrying less than five thousand a year. Temptation comes in Dick's way, and he yields to it. An old chum in the backwoods of Mexico—how convenient these backwoods are, by the way, to the playwright—occupies his last hours on

earth in writing to Dick, sending him a will leaving a fortune to him in trust for a lad whose mother had been wronged by the testator. Dick takes the money, and burns the letter of instructions. So ends Act I. In Act II., Dick is an opulent man, and we find him at a party at the house of the woman he loves. Among the guests is an amateur photographer, who is busy showing his pictures to the others; it is around one of these pictures that much interest centres. It was taken in Mexico, where the amateur had been touring, and it represents a man, in the last stage of consumption, writing a letter. The photographer prides himself especially on this picture, because it was taken under difficult circumstances, quite unknown to the man whose portrait it contains. Some one remarks upon the perfection of the photograph, and says that it is almost possible in it to decipher the letter in the man's hand. Somebody else suggests that with a microscope it would be quite possible, and, a microscope being at hand, the letter is read aloud for the benefit of the surrounding friends. Such is the story, and it is certainly both ingenious and novel; it, moreover, serves the purpose of the play in leading to the overthrow of guilt. But is the incident photographically possible? The answer must be, No!

In a very sharp negative a letter, written in bold round hand with very black ink on white paper, might be deciphered by the aid of a microscope, if the exposure had been made with that particular object. But in an ordinary portrait negative, such fine lines even if brought to a focus would be completely blotted out, the letter representing a dead-black surface. But in the case under discussion the lines are written by the shaking hand of a dying man, and we do not suppose that the quality of the ink in the backwoods of Mexico is of a very high standard. Moreover, the friend of Dick Halward has broken and lost the original negative, and the photograph presented to the microscope is a paper print, in which the fibrous nature of the surface would be far more apparent under magnification than any such details as the handwriting on a letter.

This last example of dramatists' photography raised a wonderful amount of gossip and correspondence in the press, and probably proved a very good advertisement for the play; and, if it is a little far-fetched, what does it matter? We must not take our playwrights or our novelists too seriously, for, if we did, half the charms of life would be destroyed. In a work of fiction surely a little latitude is allowable, else we might as well begin to dissect all the most valuable traditions of our childhood's happy hours. Who shall dispute the truth of *Jack the Giant-killer*, or *Little Red Riding Hood*, or *Blue Beard?* Are we to doubt them because in these more prosaic days beanstalks do not grow to the clouds, wolves have not the gift of speech, and human hair is not generally of cerulean tint? Such idle thoughts only assail the unemployed, and we may surely leave the author of *Idle Thoughts of an Idle Fellow* to write us many another healthy play like the one under discussion, without asking questions as to probabilities or possibilities.

EPITOME OF PROGRESS IN 1896.

COMPILED BY THE EDITOR.

RADIOGRAPHY.

PROFESSOR RÖNTGEN'S PAPER: ON A NEW KIND OF RAYS.*

(1) A DISCHARGE from a large induction coil is passed through a Hittorf's vacuum tube, or through a well-exhausted Crookes' or Lenard's tube. The tube is surrounded by a fairly close-fitting shield of black paper; it is then possible to see, in a completely darkened room, that paper covered on one side with barium platino-cyanide lights up with brilliant fluorescence when brought into the neighbourhood of the tube, whether the painted side or the other be turned towards the tube. The fluorescence is still visible at two metres' distance. It is easy to show that the origin of the fluorescence lies within the vacuum tube.

(2) It is seen, therefore, that some agent is capable of penetrating black cardboard which is quite opaque to ultra-violet light, sunlight, or arc light. It is, therefore, of interest to investigate how far other bodies can be penetrated by the same agent. It is readily shown that all bodies possess this same transparency, but in very varying degrees. For example, paper is very transparent; the fluorescent screen will light up when placed behind a book of a thousand pages; printer's ink offers no marked resistance. Similarly the fluorescence shows behind two packs of cards; a single card does not visibly diminish the brilliancy of the light. So, again, a single thickness of tinfoil hardly casts a shadow on the screen; several have to be superposed to produce a marked effect. Thick blocks of wood are still transparent. Boards of pine two or three centimetres thick absorb only very little. A piece of sheet aluminium 15 mm. thick still allowed the X rays (as I will call the rays, for the sake of brevity) to pass, but greatly reduced the fluorescence. Glass plates of similar thickness behave similarly; lead glass is, however, much more opaque than glass free from lead. Ebonite several centimetres thick is transparent. If the hand be held before the fluorescent screen, the shadow shows the bones darkly, with only faint outlines of the surrounding tissues.

Water and several other fluids are very transparent. Hydrogen is not markedly more permeable than air. Plates of copper, silver, lead, gold, and platinum also allow the rays to pass, but only when the metal is thin. Platinum ·2 mm. thick allows some rays to pass; silver and copper are more transparent. Lead 1·5 mm. thick is practically opaque. If a square rod of wood 20 mm. in the side be painted on one face with white lead, it casts little shadow when it is so turned that the painted face is parallel to the X rays, but a strong shadow if the rays have to pass through the painted side. The salts of the metals, either solid or in solution, behave generally as the metals themselves.

(3) The preceding experiments lead to the conclusion that the density of the bodies is the property whose variation mainly affects their permeability. At least no other property seems so marked in this connexion. But that the density alone does not determine the transparency is shown by an experiment wherein plates of similar thickness of Iceland spar, glass aluminium, and quartz were employed as screens. Then the Iceland spar showed itself much less transparent than the other bodies, though of approximately the same density. I have not remarked any strong fluorescence of Iceland spar compared with glass (see below, No. 4).

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* Translated by Arthur Stanton from the *Sitzungsberichte der Wurzburger Physik-medic. Gesellschaft*, 1895, and reprinted from *Nature*.

(4) Increasing thickness increases the hindrance offered to the rays by all bodies. A picture has been impressed on a photographic plate of a number of superposed layers of tinfoil, like steps, presenting thus a regularly increasing thickness. This is to be submitted to photometric processes when a suitable instrument is available.

(5) Pieces of platinum, lead, zinc, and aluminium foil were so arranged as to produce the same weakening of the effect. The annexed table shows the relative thickness and density of the equivalent sheets of metal :—

	Thickness.	Relative thickness.	Density.
Platinum...........	·018 mm.	1	21·5
Lead..................	·050 ,,	3	11·3
Zinc	·100 ,,	6	7·1
Aluminium.........	3·500 ,,	200	2·6

From these values it is clear that in no case can we obtain the transparency of a body from the product of its density and thickness. The transparency increases much more rapidly than the product decreases.

(6) The fluorescence of barium platino cyanide is not the only noticeable action of the X rays. It is to be observed that other bodies exhibit fluorescence, *e.g.*, calcium sulphide, uranium glass, Iceland spar, rock salt, &c.

Of special interest in this connexion is the fact that photographic dry plates are sensitive to the X rays. It is thus possible to exhibit the phenomena so as to exclude the danger of error. I have thus confirmed many observations, originally made by eye observation with the fluorescent screen. Here the power of the X rays to pass through wood or cardboard becómes useful. The photographic plate can be exposd to the action without removal of the shutter of the dark slide or other protecting case, so that the experiment need not be conducted in darkness.

Manifestly, unexposed plates must not be left in their box near the vacuum tube.

It seems now questionable whether the impression on the plate is a direct effect of the X rays, or a secondary result induced by the fluorescence of the material of the plate. Films can receive the impression as well as ordinary dry plates.

I have not been able to show experimentally that the X rays give rise to any calorific effects. These, however, may be assumed, for the phenomena of fluorescence shows that the X rays are capable of transformation. It is also certain that all the X rays falling on a body do not leave it as such.

The retina of the eye is quite insensitive to these rays ; the eye placed close to the apparatus sees nothing. It is clear from the experiments that this is not due to want of permeability on the part of the structures of the eye.

(7) After my experiments on the transparency of increasing thicknesses of different media, I proceeded to investigate whether the X rays could be deflected by a prism. Investigation with water and carbon bisulphide in mica prisms of 30° showed no deviation either on the photographic or the fluorescent plate. For comparison, light rays were allowed to fall on the prism as the apparatus was set up for the experiment. They were deviated 10 mm. and 20 mm. respectively in the case of the two prisms.

With prisms of ebonite and aluminium I have obtained images on the photographic plate which point to a possible deviation. It is, however, uncertain, and at most would point to a refractive index 1·05. No deviation can be observed by means of the fluorescent screen. Investigations with the heavier metals have not as yet led to any result, because of their small transparency and the consequent enfeebling of the transmitted rays.

On account of the importance of the question it is desirable to try in other ways whether the X rays are susceptible of refraction. Finely powdered bodies allow, in thick layers, but little of the incident light to pass through

in consequence of refraction and reflection. In the case of the X rays, however, such layers of powder are for equal masses of substance equally transparent with the coherent solid itself. Hence we cannot conclude any regular reflection or refraction of the X rays. The research was conducted by the aid of finely powdered rock salt, fine electrolytic silver powder, and zinc dust already many times employed in chemical work. In all these cases the result, whether by the fluorescent screen or the photographic method, indicated no difference in transparency between the powder and the coherent solid.

It is, hence, obvious, that lenses cannot be looked upon as capable of concentrating the X rays ; in effect, both an ebonite and a glass lens of large size proved to be without action. The shadow photograph of a round rod is darker in the middle than at the edge ; the image of a cylinder filled with a body more transparent than its walls exhibits the middle brighter than the edge.

(8) The preceding experiments, and others which I pass over, point to the rays being incapable of regular reflection. It is, however, well to detail an observation which at first sight seemed to lead to an opposite conclusion.

I exposed a plate, protected by a black paper sheath, to the X rays, so that the glass side lay next to the vacuum tube. The sensitive film was partly covered with star-shaped pieces of platinum, lead, zinc, and aluminium. On the developed negative the star-shaped impression showed dark under platinum, lead, and, more markedly, under zinc; the aluminium gave no image. It seems, therefore, that these three metals can reflect the X rays ; as, however, another explanation is possible, I repeated the experiment, with this only difference, that a film of thin aluminium foil was interposed between the sensitive film and the metal stars. Such an aluminium plate is opaque to ultra-violet rays, but transparent to X rays. In the result, the images appeared as before, this pointing still to the existence of reflection at metal surfaces.

If one considers this observation in connexion with others, namely, on the transparency of powders, and on the state of the surface not being effective in altering the passage of the X rays through a body, it leads to the probable conclusion that regular reflection does not exist, but that bodies behave to the X rays as turbid media to light.

Since I have obtained no evidence of refraction at the surface of different media, it seems probable that the X rays move with the same velocity in all bodies, and in a medium which penetrates everything, and in which the molecules of bodies are embedded. The molecules obstruct the X rays, the more effectively as the density of the body concerned is greater.

(9) It seemed possible that the geometrical arrangement of the molecules might affect the action of a body upon the X rays, so that, for example, Iceland spar might exhibit different phenomena according to the relation of the surface of the plate to the axis of the crystal. Experiments with quartz and Iceland spar on this point lead to a negative result.

(10) It is known that Lenard, in his investigations on cathode rays, has shown that they belong to the ether, and can pass through all bodies. Concerniug the X rays the same may be said.

In his latest work Lenard has investigated the absorption coefficients of various bodies for the cathode rays, including air at atmospheric pressure, which gives 4·10, 3·40, 3·10 for 1 cm., according to the degree of exhaustion of the gas in discharge tube. To judge from the nature of the discharge, I have worked at about the same pressure, but occasionally at greater or smaller pressures. I find, using a Webber's photometer, that the intensity of the fluorescent light varies nearly as the inverse square of the distance between screen and discharge tube. This result is obtained from three very consistent sets of observations at distances of 100 and 200 mm. Hence air absorbs the X rays much less than the cathode rays. This result is in complete agreement with the previously described result, that the fluorescence of the screen can be still observed at 2 metres from the vacuum tube. In general, other bodies

behave like air; they are more transparent for the X rays than for the cathode rays.

(11) A further distinction, and a noteworthy one, results from the action of a magnet. I have not succeeded in observing any deviation of the X rays even in very strong magnetic fields.

The deviation of cathode rays by the magnet is one of their peculiar characteristics; it has been observed by Hertz and Lenard, that several kinds of cathode rays exist, which differ by their power of exciting phosphorescence, their susceptibility of absorption, and their deviation by the magnet; but a notable deviation has been observed in all cases which have yet been investigated, and I think that such deviation affords a characteristic not to be set aside lightly.

(12) As the result of many researches, it appears that the place of most brilliant phosphorescence of the walls of the discharge tube is the chief seat whence the X rays originate and spread in all directions; that is, the X rays proceed from the front where the cathode rays strike the glass. If one deviates the cathode rays within the tube by means of a magnet, it is seen that the X rays proceed from a new point, *i.e.*, again from the end of the cathode rays.

Also for this reason the X rays, which are not deflected by a magnet, cannot be regarded as cathode rays which have passed through the glass, for that passage cannot, according to Lenard, be the cause of the different deflection of the rays. Hence I conclude that the X rays are not identical with the cathode rays, but are produced from the cathode rays at the glass surface of the tube.

(13) The rays are generated not only in glass. I have obtained them in an apparatus closed by an aluminium plate 2 mm. thick. I purpose later to investigate the behaviour of other substances.

(14) The justification of the term "rays," applied to the phenomena, lies partly in the regular shadow pictures produced by the interposition of a more or less permeable body between the source and a photographic plate or fluorescence screen.

I have observed and photographed many such shadow pictures. Thus, I have an outline of part of a door covered with lead paint; the image was produced by placing the discharge tube on one side of the door, and the sensitive plate on the other. I have also a shadow of the bones of the hand, of a wire wound upon a bobbin, of a set of weights in a box, of a compass card and needle completely enclosed in a metal case, of a piece of metal where the X rays show the want of homogeneity and of other things.

For the rectilinear propagation of the rays, I have a pinhole photograph of the discharge apparatus covered with black paper. It is faint but unmistakable.

(15) I have sought for interference effects of the X rays, but possibly, in consequence of their small intensity, without result.

(16) Researches to investigate whether electrostatic forces act on the X rays are begun, but not yet concluded.

(17) If one asks, What, then, are these X rays? since they are not cathode rays, one might suppose, from their power of exciting fluorescence and chemical action, them to be due to ultra-violet light? In opposition to this view, a weighty set of considerations presents itself. If X rays be indeed ultra-violet light, then that light must possess the following properties:—

(*a*) It is not refracted in passing from air into water, carbon bisulphide, aluminium, rock salt, glass, or zinc.

(*b*) It is incapable of regular reflection at the surfaces of the above bodies.

(*c*) It cannot be polarised by any ordinary polarising media.

(*d*) The absorption by various bodies must depend chiefly on their density.

That is to say, these ultra-violet rays must behave quite differently from the visible, infra-red, and hitherto known ultra-violet rays.

These things appear so unlikely that I have sought for another hypothesis,

A kind of relationship between the new rays and light rays appears to exist; at least the formation of shadows, fluorescence, and the production of chemical action point in this direction. Now, it has been known for a long time that, besides the transverse vibrations which account for the phenomena of light, it is possible that longitudinal vibrations should exist in the ether, and, according to the view of some physicists, must exist. It is granted that their existence has not yet been made clear, and their properties are not experimentally demonstrated. Should not the new rays be ascribed to longitudinal waves in the ether?

I must confess that I have, in the course of this research, made myself more and more familiar with this thought, and venture to put the opinion forward, while I am quite conscious that the hypothesis advanced still requires a more solid foundation.

IRON IN PLATINUM PRINTS.

MR. J. H. BALDOCK, in the course of a paper read before one of the Societies, remarked:—

It is not our intention to travel over such a wide field as Mr. Jones has done, but rather to determine whether iron is at all times existent in platinum prints, and whether the toning, staining, or dyeing, as it has been variously called, consequent on the employment of Mr. Packham's process, can fairly be attributed to such iron. Doubtless a very interesting inquiry is opened up, and, in all probability, further experiments will be made to elucidate, if possible, in what form the iron exists, and whether chemically pure platinum is or is not capable of forming some kind of combination with tinctorial matters. But we may say at once that, so long as the effect produced is *permanent* and *pleasing*, we do not see that it materially signifies whether that effect is brought about by the agency of platinum, iron, or any other metallic base.

Through the kindness of Messrs. McKean, Reods, and Packham (members of the Society), we have had placed at our disposal a good number of platinum prints made by the hot and cold-bath processes, and also some on Pizzighelli paper, and we have submitted some of each to chemical examination in various ways. Inasmuch as platinum and iron were the only two metals present, or, rather, the only two at all likely to be concerned in the process, we have not gone through, and it is not our intention to-night to go through, the whole range of analysis for the separation of the different metals, but to confine our attention, as stated in the title of our paper, to the presence especially of iron.

1. One way to detect iron was to boil a print in aqua regia, dilute with water, filter, add ammonia in excess, and then hydrochloric acid in excess, pass sulphuretted hydrogen through this solution, filter from any precipitate that might be formed (this would consist of platinum and possibly separated sulphur), and to the filtrate add ammonia in excess, and then sulphide of ammonium, and boil. This, if iron were present, would give a black precipitate of sulphide of iron (if in *small* quantity a greenish colour by transmitted light).

2. Another shorter, simpler, and equally good method was to ignite a print in a platinum crucible until nothing but a white or greyish ash remained, boiling this with hydrochloric acid, diluting, filtering, and adding ammonia and sulphide of ammonium as before.

We demonstrate to you both these methods, and the character of the precipitate obtained *by this means* forms one of the indications of the presence of iron. But one test is never relied on alone; consequently this precipitate is collected on a filter, dissolved in a few drops of hot aqua regia, the solution diluted, filtered, rendered alkaline with ammonia, and then *just* acidulated with hydrochloric acid. This solution may now be tested with ferrocyanide of potassium, when a beautiful blue precipitate indicates iron; with sulpho-

cyanide of ammonium, when a blood-red colour indicates iron; and with tincture of galls, when an inky black, or, if very dilute, brown-black colour is manifested (experimentally demonstrated). It is hardly necessary to point out that in all analytical investigations, especially where minute quantities are concerned, it is absolutely essential to employ chemically pure reagents, and in the present instance to see that the hydrochloric acid used is itself free from iron, which is a common impurity in the commercial article.

The prints to which reference has been made were treated in this manner, first entire, then the dark part of the print, and then the white (sky, &c.) parts, with the result that *in every case* iron was detected. Some more prints were then submitted to the action of ten per cent. *pure* hydrochloric acid for two hours (this is six times as strong as the acid recommended for platinum prints, which is 1–60, and to which weak acid all the prints had been submitted in the ordinary way), washed, and then two hours more in a fresh ten per cent. acid solution, and, after washing and drying, were examined for iron. The result was exactly the same as before, except that now the quantity of iron was very much reduced (shown experimentally). It would thus appear that it is next to impossible to remove every trace of the iron, which is not surprising when it is borne in mind how difficult it is to remove ironmould from linen, or to remove every trace of iron from old documents which have been written with an ink containing iron.

One of each kind of print referred to was next moistened with water, and placed in a large wide-mouthed bottle, which was filled by displacement with sulphuretted hydrogen. The bottle was corked up, and the whole allowed to stand all night. In the morning the prints were taken out, washed, and dried, when they were *all* found to be stained brown on the coated side of the picture, further evidence of the existence of iron, as in the prints we show you.

Thus it seems evident that the effect produced by Packham's catechu solution—and a similar effect is also produced by a solution of tannic acid, as in the print before you—is due to a kind of dyeing process between the astringent matter of the catechu or the galls, and the iron in the prints, the latter acting as a sort of mordant, the *extent* to which the action is carried, as indicated by the brown colour of the print, depending on the depth of printing partly, and also partly on how carefully as much iron as is possible has been removed.

We think that we have demonstrated beyond a doubt that the iron which is always present, though in uncertain quantity, in platinum prints, certainly may be, and as certainly is, capable of producing these warm brown tones with catechu, tannic and gallic acids, but catechu gives much the best results; at the same time it would appear from the investigations of Mr. Chapman Jones, as recorded in his paper already referred to, that platinum alone is also capable of producing similar, if not such pronounced, results; but the subject is an interesting one, and would well repay any one who chose to experiment further in the same direction.

KINETOSCOPIC PICTURES ON THE SCREEN.

THE LUMIÈRE SYSTEM.

THE band of film follows the same path, whether it be a sensitive band for making a negative or a positive band used for projection; in the latter case the back of the apparatus is removed, and a strong beam of light is thrown upon the band.

Only one description is, therefore, necessary to make both functions of the apparatus understood, either as kinematograph or kinematoscope.

The band of film enclosed in B (figs. 1 and 2) is fifteen metres long and

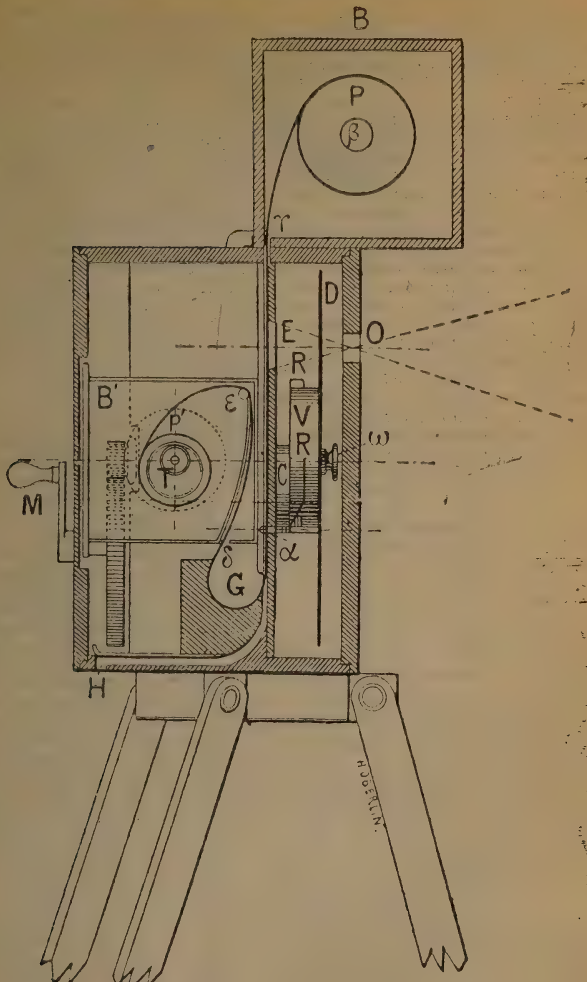


Fig. 1.

three centimetres wide; it is perforated near both edges with equidistant holes situate at the extremity of each image; the pictures taken at intervals of

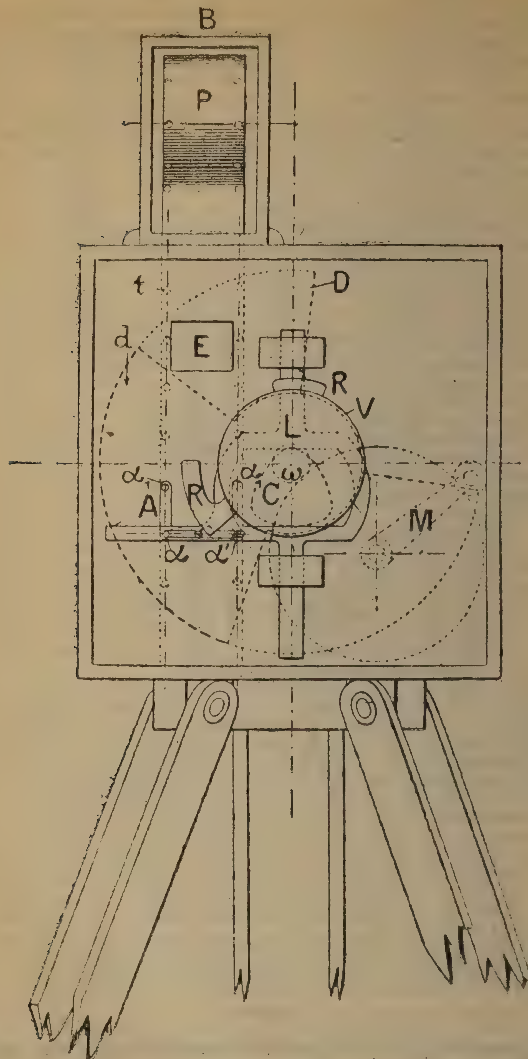


FIG. 2.

one-fifteenth of a second are exactly similar, that is to say, if two pictures be superposed, those parts representing stationary objects will exactly coincide, and the parts representing moving objects will be so situate that they represent the change that has occurred by movement in the interval between the exposures.

This band, P, rolled on a spool (figs. 1 and 2), passes through an opening, *y*, descends vertically, then passes an aperture, E, in front of the lens situated at O; thence it goes into the recess, G, to pass upwards over a small rod, E, to be carried on to a spool, P′, rotating on the axis, T.

The handle, M, turned by hand, rotates the spool by a system of cogs, and at the same time turns the arbor, *w*, of an eccentric, C (shown alone, fig. 3), and imparts a go-and-return movement to the frame, L, vertically.

From the form of this eccentric it will be seen that a regularly increasing speed is imparted to the frame, and that it decreases in like manner, and that there is a rest at each end of the track. This rest is necessary to allow two small hooks, X and A′, carried by the frame, to pass through, and return from, the holes along the edges of the band. The hooks are attached to the springs, A and C; two inclined planes, R, upon which they slide, remove them from the film when the frame, L, is at the lower extremity of its path, and they allow them to approach and engage with the holes when the frame is up. It follows that the band is drawn along the path of the frame in equal sections, and that it remains stationary whilst the frame returns. The length of the picture is, therefore, exactly that of the path of the frame.

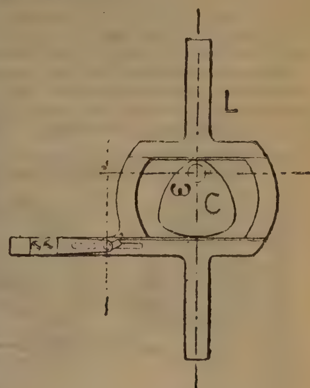


Fig. 3.

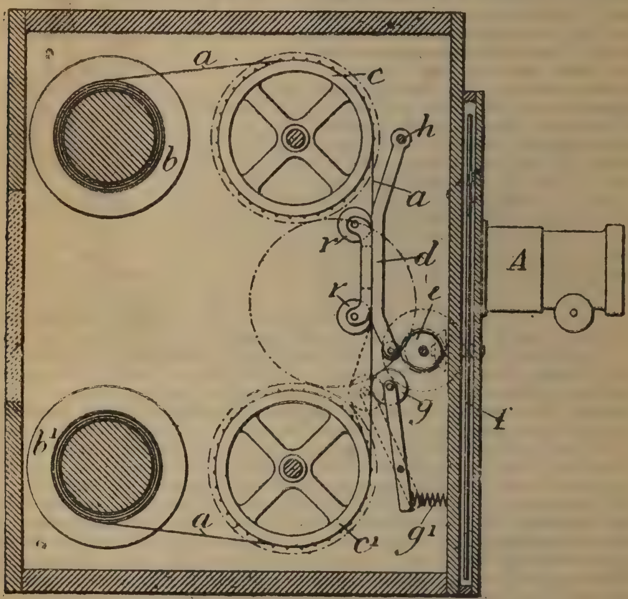
The moment the film is at rest a shutter of a disc, D, also moved by the same handle, presents its open section to the lens and effects the exposure. The light passes in either direction, whether for photographing or for projection. The opening in the disc may be regulated at will to diminish or increase the exposure as may be found necessary. In order that the film may be rolled up continuously on the spool, P′, which receives it, the film at E passes over a rod mounted on a light spring, by which sufficient elasticity is imparted to compensate for the intervals of rest caused by the eccentric. But this arrangement, which is quite indispensable for making exposures, because the film must then be perfectly guarded from light, may be dispensed with when transparencies are projected. In practice one may dispense with the drum, P′, in the latter case, and allow the film to pass out of the apparatus. The periods of rest are indispensable for exposure in making the negatives in order that the pictures shall be sharp; it is not, however, necessary that the lens be uncovered by the shutter during the whole period of rest, and the aperture in the disc may be regulated and reduced even to a narrow slit. The pauses are none the less necessary for projection, to enable sufficient light to pass. One cannot use too much, and the aperture of the shutter may be opened to its fullest extent. It suffices if the pictures follow each other at intervals of one-tenth of a second; they will then unite and give the idea of movement, owing to the persistence of vision.

MR. BIRT ACRES' SYSTEM.

Mr. Birt Acres' description of his apparatus is as follows:—It consists more particularly in so arranging the apparatus as to permit of the film being clamped for the period necessary for exposure, projection, or viewing, without causing undue strain on the film, notwithstanding that the motion of the apparatus is continuous.

For this purpose a continuous sheet of film is drawn by feeding wheels off a roller by means of two pin wheels taking into perforations made at the edges of the film. It is caused to pass behind the lens, and is clamped there for the short period necessary for exposure. The clamping is effected by an open frame pressed against the film by a cam turned by gear from the axis of the shutter, which is turned by hand or otherwise.

During the time the film is so clamped, the pin wheels still revolving would cause undue strain on the film. This I obviate by causing the film between the clamping frame and the pin wheels to be deflected out of the straight line by a roller acted on by a spring. Whilst the film is travelling this spring



deflects the film, but, whilst the film is clamped, the spring yields, and the pin wheels continuing to revolve take up the slack. Immediately the clamp is released the spring again acts on the roller, causing the film to be deflected as before. The film is then wound on to a second roller.

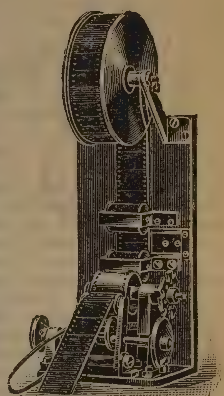
Instead of acting on the deflecting roller by a spring, it may be moved by a cam leader timed to the cam which works the clamp.

The accompanying drawing is a section of the casing of a photographic

apparatus with mechanism according to my invention for moving and clamping the film. A is the objective tube, behind which is mounted the disc shutter, f, which is caused to revolve by hand or otherwise, driving by any suitable gear a cam, e, and pin wheels, $c\ c^1$, over which passes the continuous film, a, drawn from one spring roller, b, and wound on another, b^1.

The film passes between a pair of rollers, r, and the face of a lever, d, which is pivoted at h, and is alternately pressed by the cam, e, against the film clamping it and holding it stationary, and releasing it so as to allow it to move onwards. The pin wheels, $c\ c^1$, which are geared together, are so set in the first instance as to leave between them a certain amount of slack of the film which is taken up by the roller, g, urged by a spring, g^1, causing a bend of the film. As the wheels go on while the film is clamped, the wheel, c, delivers slack, and the roller, g, yields, allowing the wheel, c^1, to take up the slack of the bend.

THE THEATROGRAPH.



Mr. R. W. Paul, of 44, Hatton-garden, is the inventor of this piece of apparatus, which is designed for the projection of kinetoscopic pictures on to the lantern screen. It is constructed of steel, gun metal, and aluminium, and of such size as to go between the condenser and objective of an ordinary lantern. The film containing the photographs is drawn from the spool at the top of the instrument, and passes under the rollers and presser pad in front of an oblong aperture through which the light passes, then under an aluminium sprocket wheel to a second spool, on which it is automatically wound up. Each turn of the horizontal shaft, which is driven from a small hand wheel, actuates a cam, which instantaneously shuts off the light, and at the same time the sprocket wheel is acted on by a steel finger, causing it to move forward the space of one picture; the film is then locked in position for projection, the shutter opens and allows the picture to be projected. In this way the film is at rest the greater part of a a revolution, giving a bright image. The rapid revolution of the shaft causes successive pictures to appear without discontinuity, as in the kinetoscope, until the whole scene has been presented.

ACETYLENE.

ACETYLENE: HOW TO MAKE.

Mr. E. Banks, who has experimented in this direction, writes: Already the inventive genius of many individuals has been exercised, and patents applied for, for generators of a more or less complex character. But nothing of an elaborate nature is at all necessary or advisable for use in the photographer's laboratory. I do not mean to imply that the apparatus I employ could not be improved upon, but for simplicity it would be difficult to beat, and, although in constant use, it has never given any cause for complaint, and is entirely automatic in its action. It simply consists of a tank of galvanised iron to hold water, and a reservoir working in this like a gasometer. This is fitted with a tap at the top as an outlet for the gas, which is generated within the reservoir itself, and, as a matter of precaution against any explosion, this outlet has two or three thicknesses of fine wire gauze over it. Inside this

reservoir, at the top, is a hook, from which is suspended by a wire a common flower-pot, which has also a piece of fine wire gauze inside it at the bottom, the use of which is to keep the residue of calcium hydrate from falling into the water. A pound of calcium carbide is put in the flower-pot as a charge, the reservoir placed in the tank, and the tap turned on to allow the air to escape, and as this takes place the reservoir gradually sinks down into the water. This necessarily causes the flower-pot to dip into the water, which, passing through the hole in the bottom, instantly generates a quantity of gas, and the meter at once rises, lifting the charge out of the water and stopping the action of the water until the gas is used up. This goes on continually until the whole of the calcium carbide is exhausted.

The inside meter is of about one cubic foot capacity, and a charge of one pound will give a continuous steady light from eight to ten hours with a pressure of one inch. The burner I use is a No. 00000 Bray's special, which consumes less than half a foot per hour. The question of a suitable burner was a difficult one. I first tried a No. 1 Bray, but the flame was so large and gave so much smoke that I had to abandon it. I next tried No. 0, and then No. 00, which was the smallest obtainable at the time, but still the smoke was great and the flame too large. With the burner above mentioned, however, the light is perfection, being perfectly free from smoke, of comparatively small area in the flame, and very brilliant. These are all points which render it of great use for enlargement or lantern work.

TESTING THE LIGHT.

THE method I adopted in making comparative tests of the light for photographic work was as follows: The light was placed upon a table, and, at a measured distance of four feet, a board was placed to receive a quarter-plate printing frame. Instead of a negative, a graduated quarter-plate actinometer screen was employed, consisting of a series of square apertures with increasing number of thicknesses of thin coloured gelatine film upon them, numbered from 1 to 25. No. 1 was clear glass, and No. 25 appeared nearly opaque, with all grades between. Selecting a good brand of commercial plates, one was placed in the frame behind the screen, and exposed to the acetylene light for three seconds, when the plate was changed, and another exposed to the three-wick oil lamp commonly used in lantern work, and yet another to the limelight blow-through jet, giving the same distance and exposure in each case. All three plates were then developed together in one dish. The experiment was repeated several times with varying exposures, but the comparative results were about the same. In the case described, the triplexicon oil lamp ranked far away the lowest, only just rendering No. 5; the acetylene came next with No. 16, and the limelight gave No. 21. As the light of the limelight appeared to the eye far the most brilliant, this result of the acetylene was a surprise, and showed that the light was exceedingly rich in actinic rays. I have not had an opportunity of comparing it with the incandescent gas burner, but I should judge it will be at least double the power.

Employed as an illuminant in the lantern, the result was at first disappointing, until I obtained the small burner, when a good five-feet disc was given, and one which would be admirably adapted for parlours or small rooms. By the use of two burners suitably placed, copying can be readily done without the aid of daylight, and, by increasing the number of burners to seven or eight, portraits could be taken at any time quite as quickly as by ordinary studio light. It will thus be seen that there is probably a useful future before acetylene in the photographer's every-day work. Into its more extended commercial use I do not propose to enter, that being outside the province of a photographic article; but, viewed from a chemical standpoint, acetylene has many points of interest.

ACETYLENE GAS: SOME FACTS ABOUT.

MR. W. H. WALMSLEY, who has devoted much attention to the subject, writes as follows: What is acetylene? It is a hydro-carbon gas (C_2H_2), the richest in carbon of any other, its components in volume being 92½ parts of carbon and 7½ parts of hydrogen, in 100. It is highly inflammable, igniting at a considerably lower temperature than ordinary illuminating gas, and burning with a very brilliant white flame when supplied to proper burners. The most satisfactory of these will not deliver more than one-half cubic foot per hour under a pressure of three inches of water, the light being equal to that of four burners of five cubic feet capacity each, using ordinary city gas of the best quality now supplied. The flame is essentially a cool one (owing to the small amount of gas consumed), but extremely hot at the point of ignition, as it must be to ensure the complete combustion of the large percentage of carbon which acetylene contains. This combustion is perfect; no carbon monoxide and but a small percentage of carbon dioxide are emitted, and the temperature of a room in which it is burned is raised no higher than it would be by a sufficient number of incandescent electric lamps to produce an equal amount of light. It has been completely demonstrated that twenty such acetylene lights will not vitiate the atmosphere to a greater extent than one five-foot flame of ordinary street gas. The quality of the light is simply perfect—"a chunk of sunshine," as some one has aptly turned it. It is, indeed, daylight. The spectrum is almost identical with that of the sun; the most delicate colours are unchanged beneath its rays, and can be as readily distinguished as by daylight. It is more diffused than any other artificial illuminant, the corners of a room being lighted equally with the immediate circle about the burners in its centre. For reading and writing it is ideally luxurious; brilliant yet soft (when properly shaded), causing no feeling of weariness or discomfort from the most prolonged usage. The flame, however, should not be gazed upon by the unprotected eye, being too brilliant for comfort or safety, and it should always be shaded in some manner. The light being of such potency that a very small burner, consuming not over one-eighth cubic foot per hour, will give the light of twenty-five candles, it may be burned in a great variety of shades and devices hitherto used only with electric incandescent lamps. No other illuminating gas can be thus used, and many new features in artistic lighting become possible with it. But it cannot be used in the large burners of five or more cubic feet capacity required with ordinary city gas. Passed through these, it burns with a brilliant yellow flame accompanied by volumes of smoke which quickly deposit a shower of soot on every thing within reach. If, therefore, acetylene be used through the ordinary gas piping of a house, the burners must be changed for those of a capacity suited to it. As these cost but a few cents each, the change is of no moment, and can be made by any one.

Pure acetylene gas is not *explosive*, and cannot be made to explode under *any* circumstances; but, if mixed with air in proper proportions, it will, *in common with all other illuminating gases*, explode with a violent detonation and destructive effects. These facts should be clearly understood by every one. A mixture of acetylene with 1·25 times its volume of air is mildly explosive, the energy increasing up to twelve times, after which it decreases until, with one volume to twenty of air, the explosive quality has entirely disappeared. Indeed, the addition of twenty-five to forty per cent. of air to the gas in no wise impairs its luminosity, whilst, of course, decreasing its cost; and an apparatus has been devised for adding any desired percentage to the gas, at the point of ignition. For heating purposes a much larger percentage of air must be used.

The highly actinic quality of the acetylene light renders it particularly valuable for photographic purposes, and nothing is risked in predicting a wonderful

future for it in this direction. Indeed, much has already been accomplished. In connexion with one of Chicago's leading photographers a series of experiments was made during the past winter, clearly proving its adaptability to work in the studio. With exposures from two to four seconds, fully toned and perfectly lighted negatives were made, the results not being distinguishable from the best day-lighted sittings. So well satisfied was he with it, that he is now having his studio fitted with acetylene apparatus for night work, probably the first in the world to adopt the new light for this purpose. It has also been successfully used in photographic printing. With several of the leading makes of printing-out paper, excellent work was done in about the time required for the same on a cloudy day. Thus all phases of studio work are made possible by night as well as by day through the discovery of this wonderful and cheap light. It is also particularly adapted to photo-micrography, and the illumination of objects under the microscope. A little lamp which I devised some months since for the latter purpose consumes only one-twentieth of a cubic foot of gas per hour, and gives a solid column of intensely white light the thickness of a small lead pencil. Photo-micrographs with the highest powers may be taken with it in less than one-fifth of the time required with the most powerful oil lamp, and it has been highly commended by many of the most distinguished workers in this department of photography, who are using it in preference to all other sources of illumination.

In no other field of lighting will the great capabilities and advantages of acetylene be more quickly realised than that of the optical lantern and stereopticon. Nearly as bright as oxyhydrogen, it is vastly cheaper, both in first cost of apparatus and in running expenses. The cost of operating a pair of dissolving lanterns, at present price of carbide, is not more than twenty-five cents per hour, while the light is quite equal to the most satisfactory illumination of a fifteen-foot screen. It is being used now by many lanternists with all sizes of lenses, from quarter size to whole, and at all distances from screen between ten and fifty feet. A small portable generator, weighing not more than twenty pounds, with suitable burners and a pound or two of carbide, completes the necessary outfit. No skilled attendant is necessary. It can be set up and put in operation in five minutes, and dismantled in as many more. The light is absolutely steady, clear, uniform, white, and satisfactory. Once started, it requires no attention whatever until the close of the exhibition. In short, it will prove (nay, even now *is*) a most formidable competitor of both lime and the electric arc lights; the Welsbach incandescent gas light bears no comparison with it, while as to the foul smelling and altogether unsatisfactory coal-oil lamp—*it* is of the past, dead beyond resurrection.

In order to utilise the acetylene it is necessary that it be generated in a closed vessel. Two *general* types are alone possible; but of *specific* forms there may be no end. In one type the gas is generated and maintained under compression, and the vessel must be made strong enough to resist any possible pressure. Should the latter reach that of forty atmospheres, or about 600 pounds to the square inch, the gas will be liquefied, under its own compression, each pound of the liquid being capable of giving off about fourteen and a half cubic feet of gas—or 400 times its own volume. This allows of its ready handling in strong steel cylinders, such as are used in the distribution of carbon dioxide or liquefied carbonic acid. Supplied with suitable valves for reducing the pressure to that of ordinary street gas, these cylinders may be attached to the supply pipe of a house, and the gas used in a very neat way without any care or thought on the part of its occupants. But this method of distribution will only be possible in towns large enough to support a liquefying plant, and the necessary and careful attendance of skilled workmen to place in position and look after the cylinders. The great bulk of consumers all over the country cannot be thus supplied, They must have a

gas-making device at once simple, automatic, inexpensive, efficient, and safe. This belongs to the second type of generators mentioned above, and it is of the only one as yet placed on the market that I now desire to speak—namely, the "Monitor" Acetylene Generator, of Messrs. Walmsley, Fuller, & Co., Chicago, the patentees and manufacturers.

The "Monitor" generators, although made in several sizes, from a capacity for a single light to that of supplying a large house, are all of the same specific form and character—a combination of generator and gasometer, or gas-holder in one. With the exception of the smallest size, which practically has no gas-storing capacity, they are perfectly automatic, generation of gas ceasing whec it is not being burned. The gas is at no time under a greater pressure than that of a three-inch column of water, slightly in excess of that in the pipes supplying street gas, but better adapted to the smaller acetylene burner than the two-inch pressure of the latter. This never varies at any time from the moment the generation of gas begins until the supply of carbide is exhausted, and is the same in each size of generator, the proportions of area

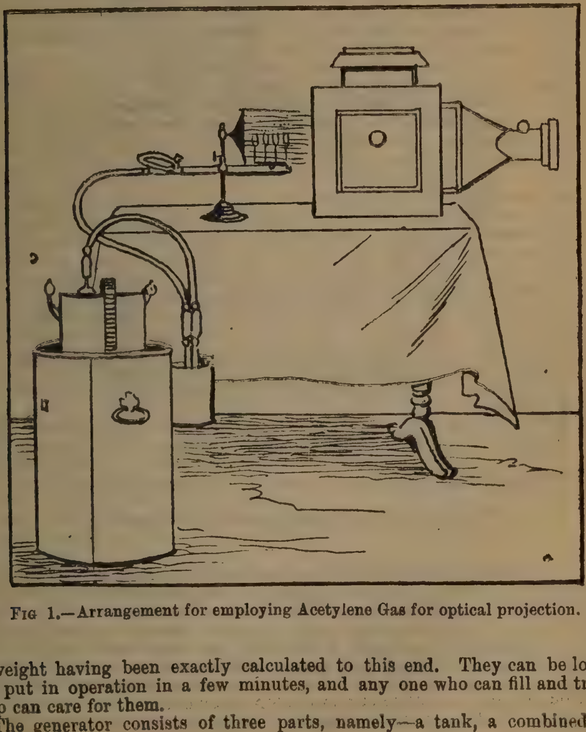


FIG 1.—Arrangement for employing Acetylene Gas for optical projection.

to weight having been exactly calculated to this end. They can be loaded and put in operation in a few minutes, and any one who can fill and trim a lamp can care for them.

The generator consists of three parts, namely—a tank, a combined gas

generator and holder, and a drying box, or purifier. The generator slides up and down within the tank, and, when lifted out, a galvanised iron pan will be found in the latter, the use of which is to catch and hold the calcium hydrate formed during the evolution of gas from the carbide. The top of the generator, through which the carbide is loaded, is sealed by a water jacket. To put in operation, the tank is filled with water to within five or six inches of its top. The water jacket of the generator is also filled, quite to its top,

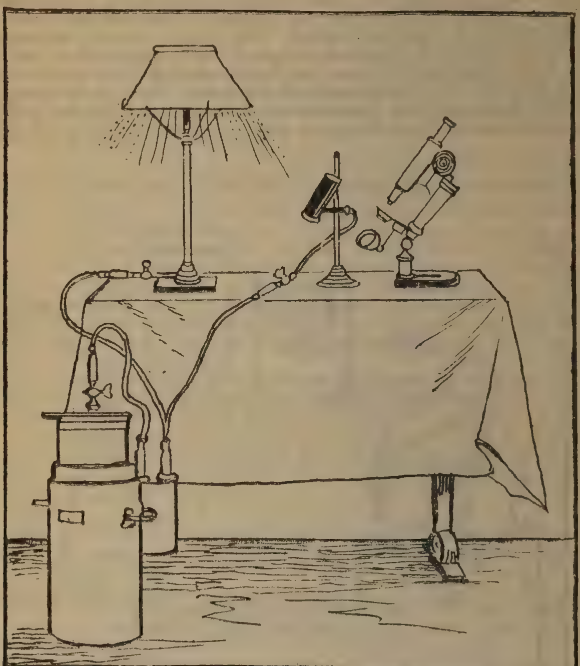


FIG. 2.—Acetylene Gas employed for microscopic work

and the generator is lowered into the tank until a catch on its top engages with the top of the former, preventing it from sinking any lower. It will then be found that the wire netting, which is placed in the generator in such a manner as to form a flooring across its entire interior, is about two inches above the surface of the water in the tank, and quite dry. The carbide is then placed on the netting, the pieces distributed over its surface evenly, and the sealing case of the water jacket put into position and pushed down tight, where it is held by a self-acting spring. A gas hose nozzle, with stop cock, rises from the top of the water jacket. The cock being opened, the catch

holding the generator to top of tank is released, and it sinks down into the latter, driving out the imprisoned air within through the open stop cock. The moment the wire netting carrying the carbide is immersed in the water, gas is evolved, which issues from the cock in the form of a warm steam. The stop cock is then to be closed, and the generator is ready to supply gas until the carbide has given up its last cubic inch. The loading should not be done nearer than five or six feet to a fire or light of any kind, as a slight explosion might occur if the gas were lighted before the mixture with air is entirely driven out. This is the only possible chance of such an occurrence, and it need be no chance if the slightest precaution to avoid it be taken.

Considerable heat is evolved during the generation of the acetylene, as there is when a piece of unslaked lime is placed in a vessel of water, and for the same reason. The gas consequently comes off both warm and moist, and, if conveyed in this state directly to the burners, will condense in the pipes or tubes, causing an irregular and fitful flame. This is particularly observable in cold weather. The object of the drying box is to prevent this, which it does in a very simple and perfect manner. It is really a double box, one within the other, but with no intercommunication. The outer chamber is filled with cold water, the inner is empty, saving the presence of several metallic fans, presenting a considerable surface over which the warm gas must pass, being cooled and dried on the way. Two tubes, with hose nozzles, lead into this chamber. A short piece of flexible hose connects the nozzle on top of the generator with one of these; to the other is attached a second hose leading to the burners. The stop cock on the generator being opened, the gas flows into the purifier, issuing therefrom cool and dry, ready for burning, which it will do with absolute steadiness and uniformity from first to last. For convenience, the drying box is hung by a suitable catch to the side of the tank.

The "Monitor" generator, as has been stated, is absolutely automatic in its action. It will furnish gas for one burner of any size, from the tiny microscopic lamp of $\frac{1}{20}$ cubic feet capacity to the Bray 00000, of over one foot per hour, or as many burners at once of any size as its capacity will supply, with equal steadiness and satisfaction, the pressure not varying a quarter of an inch at any time. If the gas be all turned off, the generator will continue with diminished rapidity until the rising of the holder lifts the load of carbide out of the water, when it will cease altogether. If necessary, it can be left in this condition for an almost indefinite time, ready for instant use. The acetylene is absolutely unchanged by standing in the holder for any length of time. A new form just completed combines generator and lamp in one, without use of hose or drying box, the gas being cooled and dried in a series of capillary tubes, which are not seen. Its general appearance is that of a handsome parlour-table lamp with shade. It is made in a great variety of forms.

THE WASHING OF PRINTS.

In a paper read at the Convention, Mr. A. Haddon said: The results I have given you thus far are those obtained when the paper has been washed in running water; but this mode of washing cannot be universally employed, as in some cases water may be scarce, and in others it may not be convenient to leave the prints to the tender mercies of the servants in the kitchen, or even in the bath room, and then it becomes necessary to remove the hypo by soaking the prints in water contained in shallow dishes. When this method of washing is adopted, three questions have to be answered before we can say that all the soluble salts have been removed from the prints.

1. What must be the ratio of the volume of water to the area of paper to be washed?

2. How long must the prints be allowed to soak in each quantity of water?

3. How many changes of water must the prints be subjected to?

These questions we have endeavoured to answer in a paper read before the London and Provincial Photographic Association.

We selected albumenised paper in preference to gelatino-chloride, as the latter is usually so loaded with sulphate of barium that it is exceedingly difficult to obtain clear solutions by filtration through paper, especially when treating the ash of the burnt paper with ammonia; and, from what we now know, it is perfectly clear that what is true of the one kind of paper is equally true for the other as regards time of washing.

We did not attempt to determine the amount of sulphur left in the paper, as it will be remembered that, in the case of albumenised paper, washed in running water, the sulphur and silver disappeared at the same rate, and that, when the quantity of silver became constant, then also did the sulphur, so that the determination of the silver, left at given intervals of washing, was a difficult guide to say how many changes of water, under given conditions, the paper should receive.

The albumenised paper was marked, sensitised, washed, and fixed as already described.

The first thing to be decided before proceeding to the washing of the paper was the ratio of the volume of water to area of paper. For convenience of measurement, we settled on 1 c. c. per square centimetre of paper, *i.e.*, roughly about 1 fluid ounce of water to every 4½ square inches of surface to be washed.

After the prints had been fixed the requisite time, they were plunged and separated from each other as rapidly as possible into the measured quantity of water. After soaking for five minutes with constant movement, two pieces were taken out and dried, the remainder being transferred to another dish with the quantity of water diminished in proportion to the area of paper removed.

This operation was carried on till the last pieces received ten soakings of five minutes each in ten different changes of water.

A portion of each washing water was set aside for testing with permanganate of potash, iodide of starch, and sulphuretted hydrogen, dissolved in water.

It was found, by a preliminary experiment, that one drop of each of the solutions of permanganate and iodide of starch produced a distinct colouration in a test tube, filled with water, six inches long, when looked through lengthwise at a sheet of white paper. In order to ascertain when the hypo in the washing water had exactly done its work, such a number of drops of the reagents were added to the water, in similar test tubes, so as to just match the tints in the test tubes filled with plain water and one drop of reagent.

The number of drops required in each case, and the amount of silver left after each washing, will be given in a table presently.

The papers being dry, they were placed in a porcelain dish, and heated till ash free from carbon was left. The ash was then washed several times with boiling distilled water, and then boiled with dilute nitric acid, in order to dissolve out the metallic silver. The contents of the beaker were then filtered and washed, and the ash on the filter paper subjected to the action of strong ammonia, in order to dissolve any silver chloride that might have been formed due to impurities in the nitric acid. This, when filtered, was treated with nitric acid, and added to the previous filtrate; the whole was then heated to the boiling point, and a few drops of hydrochloric acid added to precipitate the silver as chloride. The precipitate was then collected and weighed, and the silver estimated in the ordinary way.

The following table gives the results obtained :—

Change of Water.	Silver in Quarter Plate.	Number of Drops of		Sulphuretted Hydrogen.
		Permanganate.	Iodide of Starch.	
1	·0055	more than 10	more than 10	brown colour.
2	·0045	„ „ 10	„ „ 10	faint tinge.
3	·0040	2	3	no colour.
4	·0040	1	1	„ „
5	·0044	1	1	„ „
6	·0042	1	1	„ „
7	·0044	1	1	„ „
8	·0040	1	1	„ „
9	·0043	1	1	„ „
10	·0040	1	1	„ „

These results show that, at the end of the third washing, the amount of silver becomes constant, and that farther washing has no effect as regards reducing the quantity of silver left in the paper.

The hypo indicators also points to the same result, that, after the third change of water, no hypo is present to discharge the colour of the permanganate or decompose the iodide of starch.

Three soakings in different water seems at first sight insufficient washing to remove the salts, but at the same time we must remember that all the water has to do is to displace a given volume of the solution of hypo contained in a medium through which diffusion can take place very readily. The silver is already in solution, and it is merely a matter of rate of diffusion. Naturally it takes longer for the last traces to be removed than it does for the bulk of the salts to pass out.

Five minutes ought to be amply sufficient for the salts to diffuse out into the surrounding water; and, if this be so, it becomes a very simple caiculation to find how many changes of water the prints must be subjected to in order to reduce the quantity of hypo in a given area of paper to something so very small that it is incapable of producing any deleterious effect on the print.

Hypo eliminators have been recommended at different times, and praised by some and abused by others. If the same amount of trouble be taken, using plain water instead of these salts, I am sure equally good, if not better, results will follow. Any hypo oxidiser is dangerous, in that it is likely, by destroying the solvents, to throw down some silver compound when it would not have been deposited if water only had been used. Fortunately, however, we are generally recommended to give the prints three or four washings before applying the compound, and this is the safeguard, for, if it had been applied at an early stage of the washing, its effect for evil would be very much more marked than has been the case.

The removal of hypo and the silver compounds formed is an easy matter if done with care. I do not mean to say that the mere soaking of paper at the bottom of a dish for fifteen or twenty minutes will remove these salts; the prints must be constantly turned over so as to bring fresh water into contact with them. The two or three hours washing, as still recommended by several paper-makers, is a mistake, especially if the prints are left to take care of themselves. In the case of gelatino-chloride papers even proper washing for that length of time is detrimental to the quality of the gelatine, it tends to remove the alum the maker has purposely added in order to harden it, and if it be removed by long soaking, on attempting to glaze such prints by attaching them

to any support, they invariably stick. Give a short washing and the result is different.

MR. C. H. BOTHAMLEY ON THE SENSITISING ACTION OF DYES ON GELATINO-BROMIDE PLATES.*

ALTHOUGH many dyes have been examined since H. W. Vogel's discovery in 1873, very few of them exert any marked effect in making gelatino-bromide plates sensitive to the less refrangible rays of the spectrum. Only cyanine and the dyes of the eosine group (including the rhodamines), with perhaps malachite-green, alizarine-blue, and chrysoidine, exert any practically useful effect.

The main points established by previous observers may be summarised as follows:—(1) all the dyes that act as sensitisers are readily affected by light when in contact with paper, fabrics, &c.; (2) in order that a dye may act as a sensitiser, it must have the power of entering into intimate union with silver bromide, forming a kind of lake; and (3) it must show a strong absorption band for the particular rays for which it is to sensitise. It is important to observe that the converse of these statements is not necessarily true, since several dyes that have all these properties show no appreciable sensitising action.

Experiments by Dr. E. Vogel on the rate of fading and the sensitising action of the eosine dyes led him to the conclusion that the order of sensitising effect coincides with the order of fading when the dyes are exposed to light. The order in which he places the dyes does not, however, correspond with the order of fading as observed in dyed fabrics, and the experimental method that he used is open to criticism.

The author's observations on the fading of the various sensitisers when exposed to light in contact with gelatine alone led him to the conclusion that, although all the sensitisers are readily affected by light, the order of sensitising effect does not necessarily correspond with the order of fading, whether the dyes belong to the same chemical group or not.

There are two chief hypotheses as to the mode in which the dyes act, namely (1), the view held by Abney, that the dye itself is oxidised by the action of light, the oxidation product remaining in contact with the silver bromide; and when the plate is treated with the developer, the latter and the oxidation product, acting simultaneously on the silver bromide, bring about its reduction; and (2), the view first definitely formulated by Eder and endorsed by Vogel, namely, that the energy absorbed by the dyed silver bromide is partially used up in bringing about the chemical decomposition of the silver bromide, instead of being almost entirely converted into heat as when absorbed by the dye alone.

The author has found that the less refrangible rays will produce a photographic image on the sensitised gelatino-bromide plates when they are immersed in powerful reducing solutions, such as a mixture of sodium sulphite and pyrogallol. This holds good for cyanine, the eosine dyes, the rhodamines, and quinoline-red, whether the sensitiser has been added to the emulsion or has been applied to the plate in the form of a bath. It is therefore impossible to attribute the sensitising effect to any intermediate oxidation of the dye.

Experiments with various reagents, such as potassium bromide, potassium dichromate, mercuric chloride, and dilute hydrogen peroxide, seem to show that the chemical nature of the latent image produced by the less refrangible rays on the specially sensitised plates, is precisely the same as that of the latent image produced by the more refrangible rays in the ordinary way.

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* Read before the British Association (Section B), Ipswich Meeting, 1895.

Further proof in the same direction is afforded by the fact that the effect of the sensitisers extends to the production of a visible effect by the prolonged action of light.

The balance of evidence is therefore greatly in favour of the view that the dye absorbs the particular groups of rays, and, in some way which is not at all clear, hands on the energy to the silver bromide with which it is intimately associated, and which is thereby decomposed.

ANTHION.

Under the above descriptive title is introduced a new and useful auxiliary to the every-day work of the photographer. It purports to be a perfect eliminator of the last traces of hypo, or, to speak correctly, thiosulphate of soda, whether in the gelatine film of the negative or the paper print. Upon carefully testing this, and following exactly the simple instructions issued with each bottle, its claims as an effectual destroyer of the fixing agent are fully borne out. Anthion is a granular crystalline salt, exceedingly rich in oxygen, and sparingly soluble in water. Its solubility, in fact, is only one in two hundred, and the solution, if kept in a well-corked bottle, will be good for a month, but is slowly decomposed, even at ordinary temperature, giving off oxygen or ozone. It is presumably the persulphate of potash ($K_2S_2O_8$), and is thus a salt of persulphuric anhydride, the corresponding acid to which has never been isolated. According to Watts, potassium persulphate is obtained by passing a current of three to three and a half ampères for some days through a saturated solution of the acid sulphate of potash ($KHSO_4$) contained in a platinum dish, wherein is suspended a porous cell containing dilute sulphuric acid. The platinum dish stands in one of copper, through which a stream of cold water is allowed to run, and which is connected with the battery so that the platinum dish forms the anode. The cathode consists of a stout platinum wire immersed in the sulphuric acid. The granular salt, which gradually forms, is collected and dried. Potassium persulphate is decomposed by heat giving off SO_3 and O, whilst KSO_4 remains behind. Silver nitrate gives no precipitate at first, but a black silver oxide is afterwards thrown down, and the solution becomes acid. Potassium iodide is decomposed with the liberation of iodine, whilst litmus and turmeric are bleached. By these reactions it will be seen that anthion is possessed of very similar properties to hydrogen peroxide.

Following the instructions, eighty grains of anthion were dissolved in forty ounces of lukewarm water. A half-plate negative, after fixing, was washed in about a pint of water contained in a porcelain dish. After five minutes' soaking, the plate was transferred to a second dish containing eight ounces of anthion solution, and allowed to soak, with occasional rocking, for another five minutes. This operation was repeated with fresh water and anthion solution, when it was found that every trace of hypo was removed from the plate. The test given in the sheet of instructions is to add a few drops of a twenty-grain solution of silver nitrate to an ounce or so of the last washing water, when, if the white precipitate which forms turns yellow, the hypo is not all eliminated. A more satisfactory and easy test is the iodide of starch. For this purpose a piece of paper sized with starch is brushed over with a very dilute solution of iodine in water. A violet colour is produced, which is instantaneously bleached if the slightest trace of hypo remains in the water. A drop from the corner of the negative, after about five minutes' washing from the last dish, was allowed to fall on the coloured paper, and the absence of hypo was shown by the violet colour remaining unaltered.

Of course, the fixing salt can also be discharged with equal facility from prints, and in this case several may be manipulated at the same time and a similar test employed. In the case of prints, however, it will be found handy to have a small bottle of dilute iodine solution at hand, when, by applying a

drop to a corner of the print at the back, using a very small brush, or even a match, for the purpose, the violet stain characteristic of iodide of starch will appear if the hypo has been discharged.

It will be understood, however, that the instructions described are only for extreme cases, where the supply of water is very limited. If running water is available, of course it would be advisable to utilise it; but even then a short immersion in anthion makes the absolute elimination of the hypo a matter of certainty. In that case, even a little flowed over the washed negative, and allowed to soak in for a few minutes, will be found effectual. Especially when a negative has to be afterwards intensified with mercury, anthion will be found to be of great service, for then the least trace of hypo in the film will cause the well-known yellow stain, which cannot be eradicated.

The advantages of anthion will be readily appreciated, for it is, in its crystallised state, a stable salt, ready for instant use at any time, whilst nearly all the hypo eliminators hitherto employed are of varying composition and uncertain in their action.

STEREOSCOPIC PROJECTION.

E. W. SCRIPTURE'S METHOD.

EXHIBITORS of lantern views have often made attempts at relief effects on the screen. Such attempts necessarily fall short of true relief on account of the neglect of the fundamental fact of binocular vision, namely, that two slightly different views must reach the two eyes separately. No manipulation of the lanterns or the screen can get around this psychological law.

Having promised to deliver a public lecture on binocular vision, it occurred to me that, unless I could show actual pictures in relief to the audience, the lecture would be folly of the worst kind. To escape from the quandary, I sought a method of stereoscopic projection, and found it.

In the first place, it is necessary to be able to present pictures to the two eyes separately. Spectacles of coloured glass, with a particular red for the left eye and a particular green for the right eye, can be arranged so that green light of a definite colour cannot get into the left eye, and red light of a definite colour cannot get into the right eye, whereas each can get to the eye having a glass of the same colour.

In the next place it is necessary to present the pictures in the aforesaid green and red lights. This is done by using two lanterns, one throwing green light and the other red light.

In preparing for an exhibition various details must be attended to. The coloured glasses are made from the standard red and green glass used by railways. When a piece of red is placed over a piece of green, no light ought to get through. The faint brown light that actually does get through has no appreciable effect. This is the way in which I test the glasses. I first select several squares of red and several squares of green that together permit only a faint light to go through them. This eliminates a very disturbing kind of glass made for railways by some manufacturers. To the eye it differs very little from a true red, but it lets nearly all the green rays through. Then from the red squares I reject all that are too deep in colour; otherwise the light of the lantern is so much weakened as to be scarce visible to the audience. Finally, for limelight lanterns, I select a very light (thin) red square and a moderately dark (thick) green one, and, for electric lanterns, a light red one and a very dark green one. These squares are inserted behind the slide-carriers and in front of the condensers. The green square sometimes cracks from the heat; therefore several should be kept ready.

In regard to the spectacles, I adopt the following procedure: For economy's sake I use merely two pieces of glass about one inch square, held before the

eyes with the two hands. Eyeglasses with the two glasses can be obtained for about thirteen dollars per hundred; spectacles for about fifteen dollars. By a little manœuvring, the plain coloured squares can be obtained for about one dollar per thousand. The "manœuvring" consists in buying refuse chips where railway signals are being made. An understanding with the glass-cutter will cause him to throw into one keg all the green chips, and into another all the thin red chips. These are afterwards cut into small pieces. The red pieces must be sorted. A sheet of green is supported on two blocks above a white surface; the red pieces are scattered over it, and all which let through the green light (the peculiar red referred to) and all that are very dark are rejected.

From the stereoscopic negative two lantern slides are made, one from each half. The picture intended for the right eye is placed in the green lantern, that for the left eye in the red lantern. Both are thrown together on the screen. When the spectacles are held before the eyes, the image for the right eye is selected by the green glass, and that for the left eye by the red glass. The two pictures thus reach the eyes and the brain separately. The result is an actual relief.

The relief appears just as real as a real object. This is necessarily the case. For example, in looking at the room in which you sit, each of your two eyes receives a different picture, as can be proved by closing one eye at the time. When two such views are projected upon the screen, and are then gotten to the eyes separately, the result must be exactly the same as before—the relief must be just the same as if the room were actually seen. With one exception, however, the pictures seen by my method appear in lights and shades, the colours being lost.

This reality of the pictures cannot be understood by persons who have only seen pictures in the stereoscope. There the result is a minute relief model. A like effect happens by my method when the screen is too small for life size. A view of the Brooklyn Bridge, for example, appears like a model; but, when the pictures are life size, the observer finds it hard to believe that, for example, he cannot actually advance along the shaded roadway before him, or step into the boat waiting on the shore, or pat the dog that greets him, &c. The things he sees are, apparently, real objects.

The method is, as far as I am concerned, original. It is also, as far as I can learn, new, although it seems hard to believe that such a simple principle has not already been discovered a dozen times over.

The possibilities of this method in combination with the strobo stereoscopic pictures, such as are used in Edison's kinetoscope, are limitless. By proper arrangements the two sets of pictures of the kinetoscope might be projected in two colours to the same spot on the screen. They would be separated by the coloured spectacles, and would be seen as real objects. By projecting life-sized pictures on a screen in front of a theatre stage, a whole play might be given apparently on a real stage. As long as the spectacles are kept on, the audience could not tell the difference from an actual stage except for the lack of colour. Edison, dreaming of such a possibility, believes that in coming years, with the aid of the phonograph, "grand opera can be given at the Metropolitan Opera House at New York without any material change from the original, and with artists and musicians long since dead." There is no possibility, however, of the relief effect being accomplished unless the two pictures are gotten to the two eyes separately by some such method as I have described.

There is, finally, one very important application for my stereoscopic method. With very large classes the details of scientific apparatus are invisible to all except a few. The usual remedy is to throw a photograph on the screen. Being a flat view, the student cannot understand it, and cannot become interested in it so well as if he viewed the real thing.

Suppose, for example, the lesson is on the graphic method of recording

time. The instructor sets up the chronograph, &c., and takes a stereoscopic view. The stereoscopic slides are made and projected. Each student then sees, by my method, an apparently real chronograph, ten to twenty feet long.

Or suppose the lesson is on the general anatomy of the brain. Various dissections and preparations are made and photographed stereoscopically. The students can then see actual solid brain preparations twenty feet in diameter. As the size of the human brain makes efficient instruction impossible to classes of more than twenty students, the gain is evident.

TRANSFERRING FILMS WHILE WET.

We wish to explain in this article how very simple an operation is the removal of a wet film and its transfer to a plain piece of glass. There is nothing novel in the process, yet, if you were to take a poll of the photographers who, when they have a cracked negative, make any attempt to remove it from its first support and place it on another plate free from injury, we should find an exceedingly small number who have ever even attempted to carry out this simple mode of remedy. Instead of doing this, all sorts of dodges are tried to get rid of the effect of the crack in the printing. But not alone is there an advantage in remedying a broken negative ; while performing the transfer, it is just as easy to reverse the film as to place it in its original position, and we have then a plate suitable for carbon printing or collotype work.

Then, again, though frilled plates have for a long time been of exceptional occurrence, occasions do arise when the defect is experienced, and particularly is this the case with a recently introduced make of plate which, possessing, as it does, certain positive advantages in a particular direction, are very liable to frill. We have seen a negative on one of these frill in half a minute's time for a distance of two inches from the margin. Under such conditions, though it is possible to reduce the frill by alcohol, there is usually a difference of density between the frilled margin and the rest of the plate. All that then is needed is to remove the entire film and place it on a fresh glass ; the frilling does not show, and a perfect negative is the result.

The removal of the film is brought about by simply leaving the negative to soak in a dilute solution of almost any acid, the effect being the gradual entire loosening of the gelatine film. When this method was first published, and for some time afterwards, the use of hyrofluoric acid was considered necessary ; but we believe Professor Burton was the first to point out that the solvent action of this acid upon the surface of the glass was not, as was thought, the necessary element in the loosening ; he pointed out that almost any acid would produce the same effect. Possibly citric acid is as suitable as any, but sulphuric, hydrochloric, nitric, and other acids are also effectual. Nitric acid is contra-indicated on account of its solvent action on the image, but we have, under stress of circumstances, used it without any apparent deterioration of the negative. We may here point out that, concurrently with the loosening of the film, an enlargement of its dimensions also takes place. There are occasions when this is an actual advantage, and when working with large plates it is not often the case that the size and proportions of the view or portrait are so accurately arranged that an enlargement would be a detriment. It is, however, necessary, if enlargement of the negative be contemplated, that it should be more dense than usual, for it goes without saying that if, say, a square inch of image be spread over two square inches, it will possess a decreased light-obstructing power. These, however, are side issues on the main question, and it will not be needful to do more than thus cursorily to refer to them.

We will suppose a cracked negative is under treatment, the film itself being, of course, understood to be unbroken. If it is varnished, the varnish will, for

the process we discuss, have to be removed. Soaking for some time in methylated spirit, followed by successive washes of fresh clean spirit, will usually suffice, without any potash or other addition, although a few drops of ammonia in the last spirit will prevent any possible precipitation of the shellac of the varnish upon the plate.

The varnish removed, the plate is removed to a five per cent. solution of acid in water. After the lapse of an hour or two the film may perhaps be seen floating above the glass, or it may be still adherent in one or two places. In the latter case a firm, but gentle, pushing with the finger will cause the adhesion to give way. The broken glass can then be removed and a larger piece placed under the film, after which glass and film may be transferred to another dish of water, and finally into another of distilled water. A good sample of tap or river water will answer; but, if the supply contain much lime, it should be rejected, for obvious reasons.

At this stage all that is now required is to slowly and carefully lift glass and film out of the water. This can easily be done by pinching the film to the glass at one side by the finger-ends, raising that end slowly, tilting the whole and withdrawing it gradually, and setting it up to dry. It will usually adhere without any substratum, though, if necessary, the final support may have a covering either of gelatine or collodion, washed before it is dry. If it is found that, when the film and its new support are removed from the water, it is not quite squarely placed upon the glass, it can be, without any great difficulty, adjusted with the fingers.

If the negative is to be reversed, the film while in the water may be turned upside down without the slightest difficulty.

So far, we shall have a negative enlarged from its original dimensions, and this is the best way in which to obtain facility in an operation which is really far more simple than this description would suggest. If it be desired to reduce it to a smaller, or its original dimensions, the film must be transferred to a bath of methylated spirit; it will then quickly shrink to its proper, or even a smaller, size. The operation of transferring is just the same, but it must be very quickly performed, or wrinkles in the film may be produced.

Finally, it may be observed that the extent of this shrinkage may be reduced by diluting the spirit with a small quantity of water, which, at the same time, will reduce the difficulties of transferring with spirit.

If at any stage it be found that a bubble of air has become imprisoned, it may be squeegeed out by the finger or by a mop-shaped camel's-hair pencil. When the transfer is out of the spirit, cases may arise where it would be advisable to immerse the whole in the liquid again, and work the bubble away while all was underneath the surface.

CALCIUM CARBIDE AND ACETYLENE.

MR. JAMES SWINBURN, in the course of a Cantor Lecture on *Applied Electro-Chemistry*, delivered at the Society of Arts, said :—

This compound has created an enormous sensation in the financial world, or at least in the speculative part of it, during the last year or so. As far as its discovery in America goes, it appears to have been a mere matter of chance, an invention in the literal meaning of the word. The formation of calcium carbide from carbide and lime seems to be a mere question of temperature, and to have nothing to do with electrolysis. It may be that lime and carbon do not react until the lime is fused or the carbon volatilised, and that the temperature of the electric furnace is needed to bring this result about. It is probable, however, that the very high temperature is necessary to bring about the reaction, apart altogether from getting the lime and carbon into contact. I have tried some experiments with an oxygen furnace, and have not succeeded in making calcium carbide even when I used a solvent for the lime, so that

there was no doubt that it came into contact with the carbon. These experiments were not tried thoroughly enough to be conclusive, but they tend to show that an exceedingly high temperature is needed. It is hardly necessary to say that an oxygen furnace, that is to say, an injection furnace fed with an oxygen and coal-gas blowpipe, gives a pretty high temperature.

The future of calcium carbide depends very largely on its cost of manufacture. It is, of course, very absurd to take the cost of coal, lime, and energy, and, calling that the cost of the carbide, to compare the cost of a candle-power-hour with that of gas as charged to the consumer. The prime cost of gas delivered into the 'hydraulic main' would be the right thing to compare in such a case, and would tell a very different story. On the other hand, the distribution of acetylene may well be much more simple in proportion than that of coal gas. If it is to be delivered by pipes, its only advantage, as far as distribution is concerned, is that the pipes will be smaller. This would make but little difference in the total cost of distribution, as it only reduces the capital sunk in mains a little. The cost of laying them would not be very much reduced.

The first thing is to get some idea of the cost of calcium carbide. The estimates given vary enormously, as very little has been published as to actual cost of manufacture. It seems probable, however, that the cost of manufacture —that is to say the cost of lime, coke, carbons, labour, and energy, taking everything at a farthing per kilowatt hour, will be a little over 6*l*. If water is used, the price comes out a little lower; but, as already explained, water power must not be reckoned upon too much, as rents will probably go up soon. It is best to be on the safe side, so we may perhaps take 10*l*. a ton as the final price of electrically made calcium carbide, capable of giving five cubic feet of acetylene per pound, packed and delivered on rail, after paying manufacturers' profits and all charges. This seems a low price, and it may be said that the various aluminium works have all the plant ready, and know exactly the cost of manufacture, and have reduced the price as far as it will go already. The business has really hardly commenced, however, and there is little doubt that the processes will be cheapened. At present it is the roughest and crudest method imaginable.

Let us assume the final price to be 10*l*. a ton, and see exactly what its future may be at that figure. Allowing five cubic feet of acetylene per pound, this gives, in round numbers, 18*s*. per 1000 cubic feet. Calcium carbide is not acetylene, however. Suppose the treatment with water raises the acetylene to 20*s*., and that it gives 20 times as much light as coal gas, it would then correspond with gas at 1*s*. per 1000 cubic feet. Now let us look at the price of gas. A ton of coal at, say, 10*s*., gives 10,000 cubic feet of gas, so gas should be 1*s*. per 1000 cubic feet; but the ton of coal gives 15 cwt. or so of gas coke, which is worth something, and over 100 lbs. of tar, which is valuable, and 20 gallons or so of ammonia liquor. Some of the 15 cwt. of coke is used to heat the retort benches, and labour, &c., has to be paid for, but still the actual value of gas at the hydraulic main is really only a few pence per 1000 cubic feet, and acetylene has no chance in comparison. The common practice of taking the price—generally the prime cost—of carbide of calcium, reckoning from it the price of acetylene, and comparing it with the price of delivered coal gas, is absurd. In addition, the great difference in lighting power comes in when the acetylene burner, though using little gas, is giving a very powerful light. Except in sitting-rooms, people want small lights about their houses, and they want to be able to turn them down at will.

Acetylene may be used for enriching coal gas. Whether it will pay depends very much on the local conditions. Cannel coal is usually employed when enrichment is necessary. The price cost of gas at any works depends on the price of coal and labour, and on the selling price of coke, tar, and ammonia. The cost of scrubbing and purifying would have to be incurred in

making acetylene on the large scale, and the cost of distribution by pipes and collection would be about the same in both cases. It is, impossible, however, to give any answer as to whether it would pay to enrich coal gas, unless one knows the real cost price of gas in a given case. Thus, to take a rough example, suppose crude gas costs 6*d.* a thousand cubic feet, so that acetylene costs forty times as much, adding 3 per cent. of acetylene would about double its lighting power, so that to replace 1000 cubic feet of gas we would have 500 cubic feet costing 3*d.*, and 15 of acetylene costing over 3½*d.* It is, therefore, clear that it will not pay to enrich with 3 per cent. of acetylene at these prices. I have not worked out figures to find the best enrichment for each relation of values of acetylene and coal gas, for it seems clear that, unless the cost of carbide is much less, or the cost of crude gas much greater than here assumed, there is no chance of its being utilised in that way. A public company does not make improvements if it can help it, and, of all public companies, gas companies, owing to their constitution and the sliding scale arrangement, are least likely to adopt such methods as enriching gas, even with the by-products of electric lighting companies, who make carbide to get decent load factors.

In addition to this, gas is not used only for lighting. It is very largely used now for heating purposes, and the incandescent mantle has come to stay, and people with stoves and Welsbach burners would strongly object to having their gas bills doubled, and their gas contaminated with a body which necessitates their renewing all their gas fittings and removing all copper and brass taps and couplings.

It does not look, therefore, as if acetylene will compete with gas at present. It may be a different matter in other countries. In the United States, for instance, gas is generally very dear. I had charge of works in Boston some years ago, and we paid 10*s.* per 1000 for gas. One shudders to think what it must cost in outlying districts. The enormous strides made by electric light in America is not owing to the good electrical engineers, but to the bad gas-producers. Perhaps the gas works are run by the urban authorities; this would account for anything. If sulphate of ammonia does not fetch good prices in America, and if tar distilling and the manufacture of dyes is not brought to the perfection they are in Europe, it is quite probable that acetylene has a much greater future there than over here, especially as, in proportion to the inhabitants, water power is much more plentiful, so that power prices may remain low for a very long time.

The next scheme is to deliver calcium carbide to houses, and let the consumers make their own acetylene. All that is needed is to add water. This sounds very simple. In the beginning of the century, gas was to be made on the spot in the same sort of way. All you did was to put coal in a retort and heat it, and off came the gas. Yet this was never practised, except in special cases, and gas never came into use generally until it was distributed by pipes ready for use. There are, of course, a few country houses and isolated establishments where they make a fluid they call illuminating gas. Exactly the same thing happened with the electric light. Each house was to have a gas engine and a dynamo, and generate its own power. Then the next idea was that the accumulators were to be left at the houses with the milk, and changed next day, or week, or month; but this never came into practice either. These two schemes correspond very fairly with those of distributing carbide for use in generators, and distributing liquid acetylene in bottles. The generators would always be troublesome in an ordinary house. No doubt the light would be much cheaper and better than that of gas as commonly used, but that is by no means everything. People forget that the average households are controlled by women. Women may understand people, but they are completely wanting in the faculty of understanding things, and they have the unreasoning conservatism and conventionality belonging to the undeveloped mind as seen in boys and

savages. A woman hates everything new, and would never understand how to work an acetylene generator until it had been in use for generations, and it was considered part of the duty of a good housekeeper to make good acetylene, as it used to be to make good beer. Of course, even then it would be done by rule of thumb. There is more than this. The first thing a woman asks when she sees anything new, be it a mousetrap or a telephone, is, 'Will it explode?' Now, no one can say on his honour that an acetylene generator won't explode. He does not think it will, in fact he feels sure it won't, and he sincerely hopes it won't, but an explosion might possibly occur. This settles the matter. The only thing to be done would be to utilise a woman's instinctive hero-worship and belief in authority, and to arrange that acetylene generators should be recommended by her clergyman or doctor. I say *her* doctor advisedly, as she does not believe in other women's doctors.

The plan of distributing liquid acetylene in iron bottles sounds more promising, as very little goes a long way, and the bottles could be connected to the house service by the acetylene company without the women of the house having anything to do with the matter. Acetylene is given off on the addition of water to the carbide, at enough pressure to liquefy in a cold bottle at once; and it might be purified at the same time. It must be remembered, however, that the comparison must be made as to cost, not with gas burned in the ordinary bat's-wing burner, which is generally not even good of its kind, but with the incandescent mantle. If any one is going to improve his lighting, he will not take up acetylene, as against the incandescent burner, unless it is better. Acetylene gives, for a cubic foot, about three times the light of the Auer burner; so that, at 20*s.* per 1000 cubic feet, it corresponds to gas at 6*s.* 9*d.* Gas seldom costs 6*s.* 9*d.* per 1000. Besides, it is easier to put in the Welsbach burners; but if a considerable alteration is to be made, the electric light may be preferred.

All the same, there is a very large opening for acetylene, apart from competition with coal gas. For country houses, and in carriages, omnibuses, trains, and on board ship, it ought to have its own way. One of the chief things wanted is a good burner that will not give smuts under any conditions.

A good portable acetylene lamp is also much needed. If the lamp generates its own acetylene, there is the difficulty of having it attended to properly, at least by maid-servants. Even paraffin lamps are seldom in good order where there are no men-servants, and the old colza-oil lamps never were. There are other difficulties, however. The action of the carbide on the water is so energetic that, each time they touch, too much acetylene is given off, and some sort of gas-holder is needed. I have tried mixing alcohol with the water to reduce the vigour of the action, and it works fairly well. I have lately found that this plan has been already fully worked out. Another difficulty is that the water gives off vapour which generates acetylene, so that, when the lamp is out of use, acetylene is being generated slowly. This means that the lamp will smell, and the smell of acetylene is not pleasant.

Small bottles of liquid acetylene for portable lamps should be no more difficult to deal with than mineral-water siphons; and a small steel-tube bottle would run a light and portable ten-candle-power lamp for a long time. The want of portability is the great drawback to gas. The electric light is a little better, but not much. The result is that candles are still used. Acetylene lamps would not ruin the carpets or cement the piano keys together.

Too much has been generally said about the poisonous nature of acetylene. Experiments show that it is not at all a serious poison, and its smell is a great safeguard. It uses so little air in burning that, on the whole, it would be a very much more healthy illuminant than gas, oil, or candles, especially if it contains no sulphur. Healthy breathing is not generally sufficiently appreciated yet. Many people still sit in close rooms and sleep with their windows shut, and the smaller air-consumption of acetylene would not really appeal

to them very much. Besides, according to experiments recently made on polluted air, the evils of vitiated atmosphere have been greatly exaggerated. Though acetylene, like carbon disulphide, is an endothermic compound, it is not easily exploded. Fulminate of silver only fires it locally. The explosion does not spread. Carbon disulphide explodes under curious conditions. If some is put in a bulb, and an air-pump connected and used, it will go off. I do not know if acetylene has any analogous properties.

Calcium carbide may come to be used in the manufacture of alcohol, benzine, and other organic products; but it is too soon to prophesy its future in these directions. A great deal must depend on its price, and one of the chief items is the cost of electrical power. It is to be hoped that it will soon be made by non-electrical methods, and its price may then be reduced considerably.

SOLUBILITY OF SILVER IN HYPOSULPHITE OF SODA.

THE following paper embodies the researches of Messrs. Haddon and Grundy on this subject :—

The following question has been frequently asked by different people at different times, 'Does a gelatino-bromide plate after development lose density during fixation?' and, up to the present, no completely satisfactory reply has been given.

According to Mr. Charters White, M.R.C.S., he failed to detect any difference between two portions of a dense film, one part soaked in a saturated soluion of 'hypo' for six weeks, and the other soaked in plain water. In each case the film was mounted in a microscopical cell and examined under a microscope.

In a second experiment, make by the same gentleman, 162 grains of metallic silver were soaked in a saturated solution of hypo for one month. At the end of this time, after being washed and dried, it was found to have lost two grains. From these observations Mr. T. C. White concludes that metallic silver is insoluble in hyposulphite of soda, and that the density of a negative cannot be altered, however long it may be left in the fixing bath. (THE BRITISH JOURNAL PHOTOGRAPHIC ALMANAC, 1893, page 552.)

In THE BRITISH JOURNAL OF PHOTOGRAPHY for 1892, a correspondent (Mr. Albert Levy) contends that the developed silver image suffers reduction more or less during fixation, and practically attributes to hypo the property of dissolving metallic silver.

In a paper written by A. H. Sexton, F.C.S., F.I.C., in *Photographic Scraps*, November, 1894, we find the following statements :—'Some pure silver in a fine state of division was prepared, weighed, and portions were placed in solutions of sodium hyposulphite of varying strength, and left at the ordinary atmospheric temperature for some days. In every case a considerable quantity of silver was found in solution, so that finely divided silver is not insoluble in sodium hyposulphite. Strips of gelatino-bromide prints, developed with hydroquinone, were put in large test tubes, covered with the solutions (hyposulphite of soda, 10 per cent., 20 per cent., and 10 per cent., with metabisulphite added to give acid reaction), and were left at the ordinary temperature, exposed to light and air. The action was slow, the image showed signs of fading in about four hours, and in about thirty hours it had almost completely disappeared. Having used amidol largely for bromide work, a large number of experiments were made with bromide prints developed with this. In one hour the image was very decidedly paler, in two hours it had become very pale, and in about four hours the image had disappeared. The reduction brought about by the action of hypo cannot be used for the reduction of over-printed prints, because the fine detail just disappears and the image soon acquires an

unpleasant brownish colour, and even after very long action a very faint brownish image remains on the paper.'

With such contradictory statements before us on such a subject, which, at first sight, seems so easy to decide once for all, we have, for some time past, been making experiments, in the hope of finding out the reasons for these discrepancies.

At the very outset it occurred to us that direct experiments on films of gelatine containing silver and silver bromide would not be suitable substances to deal with, as the matter might be very much complicated by the presence of the gelatine, and, in order to test the solubility or otherwise of silver in hypo in presence of silver bromide, we made the following experiment :—

Some silver bromide was prepared by precipitating some carefully purified silver nitrate with potassium bromide; this was thoroughly washed with hot water in order to remove all soluble salts, dried, and preserved in a stoppered bottle in the dark. About five grammes of the silver bromide were exposed in a thin layer to daylight for ten minutes, and then treated with a ten per cent. solution of pyrogallic acid and an equal quantity of a ten per cent. solution of caustic soda; the action was allowed to continue for fifteen minutes, when the liquid was poured off, and a second quantity, equal to the first in volume and of the same composition, was allowed to act for the same length of time, and then poured away. The mixture of reduced silver and unreduced bromide of silver, being washed with boiling water until all soluble matter had been extracted, was then ground in on agate mortar till it was reduced to an impalpable powder of uniform composition. A portion of this was placed between two watch glasses, and dried in a water oven until the weight became constant, showing that the powder had become quite dry. The weight of dry powder was found to be 1·7690 grammes. After being placed in a beaker, it was boiled with pure dilute nitric acid (free from chlorine); this was repeated four times, in order to be absolutely certain that all the metallic silver had been dissolved. After washing and drying, the residue, which consisted of bromide of silver, was found to weigh 1·5540 grammes. Subtracting this weight from the weight of mixture operated on, 0·2150 gramme is obtained, showing that the percentage composition of the original powder was :—

Metallic silver	12·15	per cent.
Silver bormide	87·85	,,
	100·00	,,

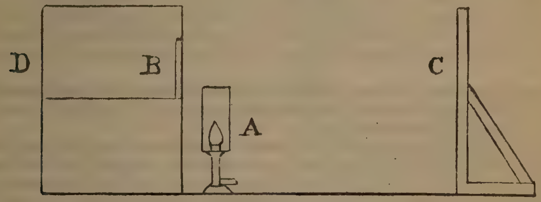
Another portion of the original mixture was dried in the same manner as before, and found to weigh 1·3700 grammes; it was then treated with 100 cc. of a twenty per cent. solution of hypo for ten minutes. This was poured off and replaced by another 100 cc. of the hypo, and allowed to act for a similar period, poured away, and the residue, consisting of metallic silver, washed, dried, and weighed. This was found to amount to 0·1646 gramme, and, calculating from this, the percentage composition, we obtain :—

Metallic silver	12·01	per cent.
Silver bromide	87·99	,,
	100·00	,,

The figures representing the amounts of silver present in the original mixture are almost identical, and well within the limits of experimental errors of a single analysis, and show that under ordinary conditions of the fixation of plates, *i.e.*, fifteen minutes' immersion in a twenty per cent. solution of hypo, no metallic silver is dissolved, and there can be therefore no alteration in the density of the silver image from this cause, unless the presence of the gelatine

should alter the character of the silver deposit. In order to test this point, the next experiment we made was on an ordinary gelatino-bromide plate. The plate, after removal from the box in the dark room, was exposed for a couple of seconds to an ordinary gas flame, at a distance of about three feet. It was then developed in metol, carbonate of soda, and sulphite. This developer was selected so as to avoid yellow stain in the finished plate. The development was not carried very far, as rather a thin image was required for examination. It was then washed and fixed in the ordinary way. The fixation was a little longer than usual (twenty minutes), so as to make sure that all silver salts that could be dissolved by the hypo were removed ; the plate was then thoroughly washed and dried. On examination by transmitted light, the opacity of the plate at the centre, at least, seemed pretty uniform. The plate was then cut in two down the centre, and examined photometrically. The photometer first tried was of the Bunsen type, but we very soon found that it was difficult to recover the same readings, in consequence of the small amount of light transmitted. We then extemporised a photometer on the plan originally used by Mons. Bouquer, for the study of the absorption of light by different transparent media.

The apparatus is very simple in construction, and, as it might prove useful to others desirous of studying the absorption of light under different circumstances, we will endeavour to describe it. A box, D, about two feet long and one foot broad was taken—the depth is of no importance. In the bottom of the box two holes were bored, about three inches apart. This was raised by means of blocks till it was of such a height that a Welsbach lamp, A, could be conveniently placed between the two holes, but out of sight of the observer when looking through the holes, the lid side of the box being towards the observer. A large sheet of white paper, C, was divided into two, and each piece supported on a frame, one half opposite each hole, at a distance of two feet from the bottom of the box. On looking through the holes, one eye for each hole, it was easy to see whether the two pieces of paper received equal amounts of light from the burner ; if not, the white screen which appeared the darker was made to approach the burner. With a little practice it was easy to hit off the exact positions when they appeared equally bright, and we could



Section of Bouquer's Photometer.—A, Welsbach lamp. B, plates being tested. C, reflectors (sheets of paper). D, position of observer's eyes.

thus ascertain what kind of error was likely to occur in any measurement. The paper being in both cases of the same kind, and there being but one source of light to deal with, for equal illumination the two pieces of paper ought naturally to be the same distance from the lamp. This photometer is far more simple than the Bunsen, as with the latter two sources of the same intensity are required, and this is not a very easy matter to realise, especially when it is necessary that they should continue to give out equal amounts of light over a

long period. With Bouquer's photometer, one source of light only being required, if it vary for the one screen, it varies for the other in the same proportion.

The photometer being set up, one portion of the plate was placed in front of one of the openings and the other in front of the other, B, and one of the screens moved backwards and forwards till they, or those portions that were visible, appeared equally bright. This was repeated several times and proved that the superficial examination of the plate was correct, *i.e.*, that the opacity was uniform. One of the pieces was then soaked for twenty minutes in a twenty-five per cent. solution of hypo. At the end of that time it was placed in water, to remove the hypo; and, in order to prevent any unequal charge due to this second soaking, the other half was soaked in the same vessel. After washing for half an hour, the plates were allowed to dry spontaneously, and again examined. No change in opacity could be noticed, so that during twenty minutes' soaking in a twenty-five per cent. solution of hypo no change in density can be detected photometrically.

The same piece of the plate that had been soaked in hypo for twenty minutes was returned to the solution, together with a piece of gelatino-bromide paper which had been exposed so as to obtain a graduated strip, developed and fixed, and the two left in the solution for twenty-one hours. During this interval the paper, for some reason, shifted in position and covered a portion of the plate. When examined at the end of this time, it was found that the portion of the plate which was uncovered by the paper had changed from black to brownish yellow, while the covered portion was still black, but much less dense. The paper had lost its original blackness and was also changed to yellow, the different gradations being still distinctly visible. The portion of the plate left in the hypo for twenty-one hours was again compared by means of the photometer and, though the colours were very different, yet it was easy to determine their relative light-stopping properties. The fixed portion was to the original in the ratio of 1 : 11. The same pieces were then used to print a piece of gelatino-bromide paper, in order that we might estimate their relative powers of stopping the actinic or active portion of gaslight. In order to compare the two, the strip of paper was again exposed, so as to produce a scale of gradation, as was done previously, exposing for sixteen, eight, four, two, and one seconds to a gas flame two feet off. On development, it was found that the tint which was produced by one second of the plate long soaked in hypo corresponded to the tint produced in six seconds on the original portion of the plate, thus showing that its value as a printer was reduced from six to one.

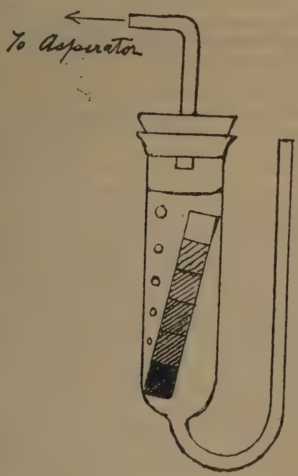
From this experiment it seemed clear to us that access of air had something to do with the reduction of the density of the image, and in order to test this the following experiments were made:—

A glass tube, about eight inches long, was closed at one end, and a strip of graduated paper introduced; the open end was then drawn out, and, when cold, a twenty-five per cent. solution of pure hypo introduced by means of a funnel. The tube was filled as full as possible and then sealed. It was not until a week had elapsed that the image turned somewhat yellow, and, though a reduction in density took place, it was not carried as far as in the case of the paper which was freely exposed, nor yet did it become as yellow, the gradations being plainly visible. The absence of air, therefore, considerably retarded the action of the hypo on the silver image.

A piece of gelatino-bromide paper was then exposed to light, developed, fixed, and washed; it was then subdivided, one piece was placed in a glass tube, and the remainder in a beaker. A saturated solution of hypo was then prepared, and made faintly alkaline with a few drops of dilute ammonia; the water, previous to dissolving the hypo, was boiled so as to expel dissolved air. The glass tube was then drawn out and by means of a small funnel filled with

the hypo solution as soon as it was cold, the remainder being transferred to a beaker, in which were placed the other pieces of paper. The printed paper placed in the beaker was, at the end of four days, completely changed in colour, the greater portion of the density was gone, and, though the paper has now been in the same solution for twenty-five days, no further change has taken place. The discolouration of the paper commenced at the water line in the case of a piece which had a corner projecting above the solution of the hypo ; the paper sealed in the tube so as to exclude air is, to all appearances, still of the same density and colour as when originally placed in the solution. In the case of the paper immersed in hypo in the beaker and exposed to air, the bulk of the silver seems to be in the hypo, as, on testing with ammonium sulphide, distinct evidence of the presence of silver was found. It is not possible to determine the quantity that is left in the paper and that which goes into solution, as the quantity of silver on a half-plate sheet of paper is too small for an accurate analysis. From this experiment we conclude that access of air is a necessary condition for the change of colour of the silver image and its solution in hyposulphite of soda.

The next point we endeavoured to clear up was whether, by bubbling air through hypo pure and simple, and then immersing a silver image in it, the



Method of bubbling air through hypo solution containing silver image.

action would go on at the same rate, or whether it was necessary for the silver to be present at the same time as the air was bubbled through.

For this purpose air was passed through a solution of hypo, nearly saturated, for twenty hours ; then (1) a strip of a graduated lantern plate was placed in it, and the tube sealed ; another portion of the original hypo was placed in a glass tube of the accompanying shape, together with (2) a strip of the same lantern plate, and air bubbled through for twenty hours ; a third strip was sealed in a tube, air having been previously driven out of the water

by boiling. The original lantern plate was exposed, so that there were six tints on it, each succeeding tint in the direction of increased opacity being exposed twice as long as the one preceding.

In the case of (1), at the end of nine days, tint No. 5 was as dense as tint No. 4 on the original plate, a slight change in colour accompanying the reduction in density, thus showing that the dissolved air had produced a certain effect in reducing the density and altering the colour.

(2)—In this case, at the end of four hours, tint No. 6 corresponded in density to tint No. 3, at the end of eight hours it equalled No. 1, and at the end of the period above stated, twenty hours, the density was completely gone, and only a yellow stain left in the gelatine, the different gradations being still visible on the plate when placed on a sheet of white paper.

(3)—This portion of the plate, though sealed in the same strength of hypo for the same time as in the previous experiments, viz., nine days, has not altered in the least; the only difference, in this case, being that the solution of hypo was, as nearly as possible, air free. These experiments point conclusively to the necessity of air being present, in order to bring about a rapid change in density and solution of the silver.

The above experiments show that a silver image may or may not be attacked when left in hypo of any strength, depending upon the circumstances at and during the time of immersion. In the experiments made by Mr. T. C. White his films and silver were contained, respectively, in microscopic cells and a test tube; in neither case had air free access, and it was in consequence of this that he noticed no change in the density of the film, and but little loss in the quantity of silver contained in the test tube.

In the experiments carried out by Mr. Sexton, though it is not stated, yet one may assume that the strips of paper were immersed in a horizontal dish containing hypo, to which air had free access; under these circumstances we should now expect a tolerably rapid change in colour and solution of the silver image.

With regard to Mr. Albert Levy's conclusion, we must say, from what we now know, that a photographic image cannot be appreciably reduced in the short time that it is immersed in hypo in order to ensure complete fixation. The experiment made with the mixture of metallic silver and silver bromide tends to prove this; also the experiment made with a developed plate, which was immersed for twenty minutes, being tested photometrically both before and after treatment, and which showed no difference in density. It is a fact well known to photographers that, if, after a plate has been developed and fixed, it is exposed to the air for a short time, instead of being washed, that the density becomes less; and that, if the image on removal from the hypo bath was black, after exposure it changes to a yellowish brown, which colour no after treatment with ordinary clearing solutions will remove. Here we have just those conditions which are best suited for attacking and dissolving the silver image. If the plate had been left in the hypo for the same length of time that it was exposed to the air after it had been fixed, no such reduction would have taken place. In the first case the hypo is exposed to the air in a thin stratum and in contact with the silver, and thus the air is able to act with much greater rapidity than when it has to penetrate a thick layer of hypo solution.

In examining the silver deposits on the gelatino-bromide plates which had been acted on by air and hypo, we were struck by the deep yellowish brown colour of the remaining silver, which was very different to its original black colour, and it appeared probable that as the hypo required the aid of air to effect the solution of the silver, this yellowish deposit was not metallic silver, but either a mixture of silver and silver sulphide or an oxysulphur compound; and, in order to investigate this point, we prepared some pure metallic silver and subjected this to the action of the hypo and air. Pure silver nitrate was taken, precipitated by means of ferrous sulphate, and the reduced silver boiled

half a dozen times with dilute sulphuric acid, then with distilled water, and then treated with moderately strong ammonia to dissolve any soluble silver compounds, and finally washed six or seven times with distilled water, dried at 100° C., and placed in a stoppered bottle.

A portion of this was placed in the apparatus already described (fig. 2) and subjected to the action of hyposulphite of soda and air. At the end of two hours a slight change was visible in the colour of the metal, and at the end of fifty-seven hours it had changed to a dark reddish brown. The action was then stopped, and the altered silver filtered off from the hyposulphite of soda solution, washed, and dried. The filtrate and washings were then treated with sulphide of ammonium in order to estimate the amount of silver that had gone into solution. This was found to amount to ·0420 grammes of silver. The reddish-brown body, which was found to weigh 1·7598 grammes, was then dissolved in dilute nitric acid and the silver precipitated with hydrochloric acid, filtered off, washed, and dried. On weighing this it was found to equal 1·7527 grammes of silver. The filtrate from the silver chloride was then taken down to dryness, with the addition of a little sodium carbonate on a water bath, hydrochloric acid added, and again taken down to dryness in order to get rid of the nitric acid. It was then taken up with water acidulated with hydrochloric acid, and, after being heated to the boiling point, precipitated with barium chloride, and the barium sulphate formed estimated in the usual way. This was found on weighing to be equal to ·003 grammes of sulphur. Calculating from these figures the composition of the original compound, we get—

Silver	99·58	per cent.
Sulphur	·17	,,
Oxygen (by difference)	·25	,,
	100·00	

The amount of silver in solution was equal to 2·33 per cent. of the original silver taken.

The fact that silver is soluble in hypo in the presence of air has not been, we believe, observed previously, and we have made a few experiments in order to ascertain, if possible, the reason.

It is well known that, if a silver salt be dissolved, even in a large excess of hypo, it will after a time deposit silver sulphide in the form of a deep black precipitate, and it seemed probable that, if we heated together metallic silver with pure hyposulphite of soda, we should obtain silver sulphide and sodium sulphite. This was carried out by sealing in a glass tube some pure metallic silver and pure hypo, and heating the whole in a water bath to 100° C. When the tube was opened after boiling for five hours, the silver was quite black, and, on testing, was found to have become partly converted into silver sulphide, and the solution, which was kindly examined for us by W. P. Bloxam, B.Sc., by the method he recently published in the *Chemical News* for the detection of sulphides, polysulphides, sulphites, thiosulphates, and sulphates in the presence of each other, was found to contain sodium sulphite. On testing the solution for silver, only the merest trace was detected.

What happens in a solution of hypo through which air is bubbled in the presence of metallic silver is that the metal attracts sulphur from the sodium hyposulphite and forms silver sulphide, and the presence of dissolved air oxidises the silver sulpide to silver sulphate, which goes into solution in the excess of hypo.

COLLODIO-BROMIDE AND TRANSPARENCIES FOR PHOTOGRAVURE.

MR. E. SANGER SHEPHERD read the following paper before the Royal Photographic Society :—

In order to produce a photogravure plate it is first of all necessary to have a transparency made from your negative, and it is only by taking the greatest care that this shall be perfect for its purpose that a perfect plate can be secured.

It is necessary that this transparency should have every tone of the subject clearly defined, and with as wide a range of gradation as possible. It must start in the highest lights, with all but bare glass in every case, but the density of the deepest shadows must be in accordance, not so much with the subject as the nature of the grain to be used on the copper plate.

Roughly you may put it in this way :—

1. Very delicate subjects with fine detail require a very fine even dust grain on the copper plate, and a very delicate transparency; all the detail must be there, but the deepest shadows must be decidedly thin.

2. All ordinary subjects, including negatives from nature, such as would print well on silver paper.

3. Reproductions of paintings with heavy masses of shadow, and very large plates, such as require a coarse grain in order to avoid muddiness.

For large masses of shadow and heavy subjects, it is necessary to get very much wider ranges of tone in the transparency, because one must use a larger dust grain on the plate, and, in order to get the requisite pluck, the etching solutions must act longer on each tone, *i.e.*, the total time of etching must be very much longer. Instead of an even-sized grain for such subjects, I prefer to use a mixed bitumen and resin grain. First, lay a coarse bitumen grain, rather wide apart on the plate, and affix by heat in the usual way; then lay a copious very fine resin grain over the bitumen, and heat only sufficient to firmly affix it to the plate. With such a grain the fine particles of resin will soon be undercut in the deepest shadows by the etching solution, leaving the bitumen to form the ink-holding capacity of the plate; but the resin will secure delicate half-tones in the lighter parts of the picture, and the few dots of white in between caused by the bitumen will add to their brilliancy.

I have here, and will pass round, two transparencies. One is a carbon print, such as would yield a good photogravure; it is from a negative from nature, that negative being of such density that it will give all the gradations and density required, by simply printing in autotype tissue. Where your negative is of this type and the required size, I think this process may always be relied upon to secure the finest results.

The second is a much more delicate subject, being a reproduction of a silver point drawing. Such a subject requires a very fine grain, preferably white resin, and, as that grain is very easily undercut by the etching solutions, it is necessary to get all the gradation in a very much closer scale.

Perhaps the easiest method of securing a transparency of any desired kind is to use collodion emulsion. Gelatine dry plates I know will do very well for many subjects, but I have always found collodion more certain and less difficult.

For the emulsion I prefer as simple a formula as possible, and, after experimenting with many, I settled on an unwashed bromide emulsion as the most suitable. The emulsion is made in bulk, using an excess of bromide, so that in the unwashed state it is very insensitive; by using it in this form, and afterwards washing out the excess of bromide, you may coat the plate in a good light, when all defects may be at once noted, dust, specks, &c., and then take the plate into a safer light, whilst washing out the excess of bromide.

With such a plate any class of transparency required may be obtained with

ease, by varying the exposure and length of development; a strong, plucky picture from a very thin negative, or *vice versâ*. I find it best with line subjects to get only a very faint image with the development and secure the requisite density by after-intensification.

To prepare 10 ounces of the emulsion, dissolve 250 grains of silver nitrate in a test tube, with 2½ drachms of water, and add 2½ ounces of warm alcohol (·805), weigh out 50 grains of pyroxyline, and place in a 12 ounce amber glass bottle, add the silver solution and 5 ounces of ether (·725) to dissolve the cotton.

In 2½ ounces of alcohol dissolve 200 grains of zinc bromide, take the solutions into the dark room, and gradually add the bromide to the collodion, shaking well between each addition.

For development I have always used the formula for pyro and ammonia given by Mr. Brooks :—

No. 1.

Saturated solution of carbonate ammonia	4 ounces.
Potassium bromide.....................................	4 drachms.
Water to	20 ounces.

No. 2.

Pyrogallic acid	6 drachms.
Alcohol	4 ounces.

For a half-plate take ½ ounce of No. 1 and 6 to 12 minims of No. 2, according to the class of transparency required.

Either hypo or cyanide may be used for fixing, but, if the negative is to be intensified, I prefer cyanide, as the film can be washed in a shorter time; I never use a substratum, but only an edging of rubber solution; dishes are not necessary, and any size plate may be coated with ease without the uncertainty of using a different batch of emulsion, as you would probably have to do with gelatine plates. A heavily weighted stone jar, with a pad fixed in the mouth, should stand in the sink to support the plate during development, &c.

It is always advisable to secure the necessary density of half-tone subjects by development or acid pyro intensification, but for line work I prefer to get a very faint, clear image with the developer, and intensify with lead; after fixing, wash well, and flow over with—

Nitrate of lead..	2 ounces.
Red prussiate potash	2 ,,
Water to	20 ,,

Wash well under the tap, and flow over with water 10 ounces, nitric acid ½ drachm, wash, and flow with sulphide of ammonium, wash, and again apply the acid. The very finest line work may be copied in this manner without fear of the lines filling.

For keeping the emulsion, I use a 10 ounce ordinary wet-collodion pourer with cap, kept in a tin with loose-fitting cover, so that it may be easily taken off with one hand in the dark room. For copying from line subjects on yellow or toned papers, add a few drops of an alcoholic solution of erythrosine to the collodion, and use a faint yellow screen.

Extreme contrast, such as required for line work, can be much more easily obtained with an unwashed than with a washed emulsion.

For line work in photogravure I prefer to have a very small amount of dust grain on the plate, and, if the drawing contains brush work or large black patches, to let these go in the etching, and recover their values afterwards

by re-etching. If you attempt to use a sufficiently large dust grain to give brilliant deep blacks, the finest lines would etch broken or rotten.

I will pass round an example. There are in this drawing a great number of very fine lines, together with solid patches of black; these fine lines, if etched over a coarse-enough grain to suit the black patches, would have been broken up into dots, but, by keeping the grain fine, the fine lines are all sweet and clean, and the solid blacks, which were undercut in the etching, have been recovered by after-biting.

I would like to mention a wrinkle in connexion with line negatives. One sometimes wishes to copy a print on coloured paper, and I have found it more easy to bleach out the colour than to attempt to make a good line negative by the use of orthochromatic plates and a yellow screen.

I may say, the only difficulty likely to be met with in making the collodion emulsion is with the pyroxyline; this should dissolve without leaving any glutinous particles. The best way is to try several brands, and, when you get a suitable one, buy a quantity; a little sand of insoluble matter in the emulsion will not matter, but always shun a cotton which gives a flossy collodion.

THE ARTIGUE AND BICHROMATED GUM PROCESSES.

Mr. Alfred Maskell writes:

The Artigue paper, when of good quality, and properly used, may be said, for delicacy of delineation and other characteristics, to be equal to any other paper now in the market, both for pictorial and for scientific work. For what we call artistic work in photography, I still think that it is better to coat the paper oneself; but this is undoubtedly a matter of difficulty, requiring a considerable amount of practice, and very few will have the patience and other necessary qualities to succeed in so doing.

To take, however, each case separately, and first the Artigue Papier Velours. This is, at present, coated upon a paper of medium roughness, slightly rougher perhaps than the AA. of the Platinotype Company, and with an excellent and even grain. How far it may be possible to proceed in the direction of rougher papers, one cannot at present say, but there is little reason to be dissatisfied with the paper at present in use. The coating is of extraordinary fineness and homogeneity, a pigment of some peculiar black, mixed with a little gum, and possibly some gelatine or glue also. Viewed by reflected light, it is a dead, velvety black, and so soft that a moist finger easily removes it. By transmitted light the paper is transparent, with a quite light grey appearance, very regular indeed, with no apparent surface faults. The secret of its quality, in fact the whole secret of preparing paper for development from the front, is the extreme tenuity of coating, and the perfection of evenness in which the pigment is held in suspension, allowing of its absolute regularity in distribution. What the pigment is, what the colloids, and how the coating is affected, are still the secrets of the maker.

The paper is supplied unsensitised, and in that state will, of course, keep indefinitely. The earlier method of sensitising was by a tedious and somewhat difficult process of brushing on the back. In my paper on the subject last year I showed that a simpler way, that by immersion, was quite as efficacious, and seemed to present no differences in result, except perhaps an increase of sensitiveness. At first, also, development was effected with baths of comparatively high temperature. Now, development is practically cold throughout, at least at a temperature no higher than that of water in summer. A brief statement of the manipulation will be useful.

To sensitise, prepare a two per cent. solution of bichromate of potash in a flat dish. Immerse the paper in this gently to avoid air bubbles for two

minutes, and hang up by one corner to dry in the dark. As the pigmented surface is so very tender and easily rubbed off if touched when wet, I find it convenient to put a little metal clip at each corner of the paper, to lay it on the bed of the dish, flow the solution over, and handle by the clips only.

Exposure is made with an actinometer in the usual way, and the paper, when fresh, has quite three times the sensitiveness of silver paper, say about the same as platinotype.

For development, sawdust in the state of a pretty thick soup is used. Of course, this is of no necessity; a brush, rocking, laving, flowing from a sponge, plain water, and other ways would develop in time, but the sawdust, which is in extremely fine powder, is, by its soft, rubbing action, very useful. Make, then, in a large, very deep, earthenware pan, a thick soup of this sawdust and cold water, and have ready a coffee-pot or similar utensil, with a very wide (about an inch wide) spout. After exposure, take the paper and place it in water at as near as possible seventy degrees (not more). In two or three minutes a faint image will be seen. Lay the paper on a sheet of glass, and, placing this on an easel over the pan, or holding it in the hand, pour the sawdust mixture along the top of the print, letting it run down back into the earthenware pan. At first the sawdust mixture should be taken from the top; afterwards, by dipping down and stirring up, it may be taken thicker. The character of the negative and the degree of exposure will determine the thickness of the developing mixture and the manner of applying it. Evidently also local development is extremely practicable, and the touch of light brushes, or other means, will come into play, for, even where affected by light, except where it is very deeply printed, the pigment is still soft and soluble, and amenable to treatment. Every now and again a dash of cold water will reveal the picture and satisfy us as to the progress of the development, and, finally, the usual alum bath, to discharge the bichromate and harden the pigment, will complete the print. Throughout, the operations have been with cold water only. There has been no anxious inspection of thermometers, no squeegeeing, no transfer from one support to another, no pressure between blotting boards; we can suspend and take up again development when we will; there is no film to blister and leave the paper, no safe edge to make to the negative, and, finally, there is no reversal, end for end, of the picture, but we have a true positive from a negative, even as in silver printing. We have left also little else but pure colour on the surface of the paper, without the disagreeable soapy gloss of a thick gelatine film holding it there in suspension.

Few words need be said regarding the preparation of pigmented paper oneself, and those who saw Mr. Demachy's beautiful work at the Salon accomplished by this method will readily concede the praise which it merited. It is the most personal of methods which we yet possess in photography, and is full of possibilities—of possibilities which will develop year by year as the Exhibition of the Salon comes round. The personality of the worker is so intimately connected with the results, from the coating of the paper to the finished print, that no rules can be laid down. Throughout, the hand of one skilled with the brush, even in the earlier stages of laying the ground to be worked on, is essential. But there may be some who may wish to be put on the track, and to whom therefore a few practical hints may be of value. They will vary them afterwards as they please, and profit by their own experiences. My recapitulation of one system of working need only, then, be brief.

Any paper which has been sized will do. The materials are a ten per cent. solution of bichromate of potash, a saturated solution of gum arabic, and any moist colours in tubes. Refined lamp-black may be used, common red ochre, with or without addition, say, of blue to modify the colour, or any other vegetable pigments. The essential is to give as thin a coating as possible to the paper, with the pigment evenly distributed and the coating uniform in thickness. No formula can be given. It will differ with the pigment employed,

and must be learnt by experience ; for, if the coating mixture is too thick, it will clog before it can be softened over with the softener ; if too thin, it will separate into round spots of colour, which will not again assimilate with the remainder. The ease of coating, then, depends upon the mixture of the gum, bichromate, and pigment in correct proportions. But suppose we have a mixture of equal parts of the three ingredients. Take a flat hog's-hair brush, and, having first pinned the paper on a board, brush the colour rapidly all over it with even strokes with a tolerably full brush, and always in the same direction. Then, with a badger's-hair softener, go all over it in all directions, first with more or less strength, then with a lighter touch, or delicately flicking it till it has become as even as you are able to make it, and so thin that you can see the grain of the paper through the colour. With opaque colours, such as lampblack, of course less of the pigment will be used. With others, more of the pigment will be necessary and less gum, otherwise the mixture would be too thick. The best plan is to begin with thin mixtures, and to tentatively increase the consistence by the addition of gum or pigment, until that which is most easily handled results. The depth of colour in the resulting print will, of course, also be affected by the amount of pigment employed. The whole thing is, however, a matter of personal practice, remembering that the *desiderata* are the thinnest possible coating applied with the greatest regularity. If these conditions are obtained in perfection, the paper is fit for any work, however fine, and we may remember also that for certain effects even these conditions may be modified.

For development various means and various implements may be used and will suggest themselves, and this question need not now be entered into at length. Sawdust, as in Artigue's system, may be useful, and various kinds of brushes. The object, of course, is to remove the still soluble pigment, where and in such proportions as we may wish to do. One good mechanical way is to place the wet print on a piece of glass, and to squeeze a sponge on the glass just over the top of the print, the sponge being dipped into water colder or warmer as may be required, so that the stream of water flows down over the prints. But there are all kinds of methods, and to those who will try this process nothing could be more absorbing or fascinating. From first to last you are working personally at every portion of your picture. Nothing is being blindly done for you by chemical reactions. Your faults are your own faults, and are capable of correction even if it is necessary to begin over again. They are not the result of the imperfect direction of a machine

PATENTED INVENTIONS OF THE YEAR.

(Selected and condensed by the Editor.)

COLOUR PHOTOGRAPHY : LUMIÈRE'S PROCESS.

THE process is thus described :—As is well known, Messrs. Cros and Ducos du Hauron's method of photographically obtaining colours consists in producing three negatives of the same object, each negative representing the negative image of the red, yellow, and blue radiations emitted or reflected by the said object, each of these negatives being then used for obtaining a monochrome image in either red, yellow, or blue. The superposition of these three monochromes reconstitutes, therefore, the colours of the original.

This process has not hitherto been practically adopted, as the obtaining and superposition of monochromes have presented great difficulties.

This result has, nevertheless, been accomplished by the communicators by the employment of the following photographic process using bichromated mucilages.

They have remarked that bichromated glue, soluble in a cold state, which does not give the demi-tints when it is employed alone, acquires this property when insoluble substances are added to it under certain conditions. If, for example, to a ten per cent. solution of glue there is added about five per cent. of bichromate of ammonia, and from about five to ten per cent. of bromide of silver emulsion, and that this preparation is spread in a thin layer upon a glass plate, there is obtained a sensitive surface which is exposed to light under the negative to be reproduced. When it has been sufficiently exposed, the plate is washed in cold water, and there is thus obtained an image scarcely visible, furnished by the glue which has been rendered insoluble, and which can be coloured with suitably chosen colouring matters.

The bromide of silver is removed by a suitable solvent—hyposulphite of soda, for example.

This process gives, with the greatest facility, positives of all the colours with all the graduations of tints of the negative.

The colouring matter can also be added before spreading the sensitive substance on the glass or other support, and a complete positive obtained by simple washing in cold water.

The patentees' claims are :—1. The employment of bichromated mucilages soluble in a cold state to which suitable insoluble substances are added, for the production of photographic images without transfer, with all their demi-tints, these substances being afterwards eliminated by suitable solvents or allowed to remain in the layer. 2. In the photographic process herein described, the employment of gelatine and other mucilages soluble in lukewarm or tepid water. 3. The employment of the process without transfer herein described for obtaining proofs in colours upon glass, paper, or other support, by the successive impression on the same plate of three monochrome images obtained from three negatives. 4. In the production of photographs in colours, the employment of the process described.

COLOUR PHOTOGRAPHY: MCDONOUGH'S IMPROVEMENTS.

THE nature of Mr. McDonough's improvements may possibly be gathered from his claims, which are as follows :—

1. A frame for holding or printing photographic pictures in colours, consisting of a receptacle for holding a negative or positive plate, a cover for holding a printing paper or material in contact with the plate, and means for moving the plate, or paper, or material, relatively to each other, to cause lines or patterns on their faces to register with each other.

2. A frame for holding or printing photographic pictures in colours, consisting of a receptacle for holding a negative or positive plate, a cover for holding a printing paper or material in contact with the plate provided with a surface of rough or tacking material next to and in contact with the paper or material, to prevent the same from shifting or expanding while printing, and means for moving the plate, or paper, or material, relatively to each other, to cause lines or patterns on their faces to register with each other.

3. A frame for holding or printing photographic pictures in colours, consisting of a receptacle for holding a negative or positive plate, a cover for holding a printing paper or material in contact with the plate, and springs and screws operating in opposition to each other for moving the plate, or paper, or material, relatively to each other, to cause lines or patterns on their faces to register with each other.

4. A frame for holding or printing photographic pictures in colours, consisting of a receptacle for holding a negative or positive plate and printing paper or material in contact, and provided with adjusting screws to effect the registration of the lines on the plate and paper.

5. A screen or plate for photographic purposes provided with coloured substances arranged according to regular recurring patterns—as dots, lines, figures—and having a portion where there is a fixed or invariable and distinctive characteristic which is reproduced in the sensitive material applied to it, by which such material may thereafter be registered or adjusted in position in use.

6. A screen or plate for photographic purposes provided with coloured substances arranged according to regular recurring patterns—as dots, lines, figures—and having a portion or portions where one line or pattern is opaqued printed over.

7. A screen or plate for photographic purposes provided with coloured substances arranged according to regular recurring patterns—as dots, lines, figures—and having a portion where a line or pattern of one colour is opaqued and others of other colour or transparent and clear.

8. A screen or plate for photographic purposes provided with coloured substances arranged according to regular recurring patterns—as dots, lines, figures—and having a portion where a line or pattern is transparent and clear, and others of other colour opaqued.

9. A screen or plate for photographic purposes provided with coloured substances arranged according to regular recurring patterns—as dots, lines, figures—and having a portion or portions where all lines are transparent and colourless.

10. A screen or plate for photographic purposes provided with coloured substances arranged according to regular recurring patterns—as dots, lines, figures—and having a portion or portions where all lines are spotted or opaqued.

11. A screen or plate for photographic purposes provided with coloured substances arranged according to regular recurring patterns—as dots, lines, figures—and having a portion or portions where one line or pattern is extended beyond the others,

12. A screen or plate for photographic purposes provided with coloured substances arranged according to regular recurring patterns—as dots, lines, figures—in combination with a screen for registering purposes, having transparent and opaque lines or patterns corresponding in register, size, and alteration with the lines or patterns of the multi-coloured screens.

13. A negative or positive photographic plate made with recurring patterns —as dots, lines, figures—and having a portion where there is a fixed, and invariable, and distinctive characteristic, which is produced in the sensitive material of the plate, and by which the plate may thereafter be registered or adjusted in position in use.

14. A negative or positive photographic plate made with recurring patterns —as dots, lines, figures—produced by the action of different coloured light in regular alternating order, having a portion of its surface printed and developed for the purpose of registering by means of and with a transparent line or pattern in each series of lines or patterns.

15. A negative or positive photographic plate made with recurring patterns —as dots, lines, figures—produced by the action of different coloured light in regular alternating order, having a portion of its surface printed and developed for the purpose of registering by means of and with an opaque line or pattern in each series of lines or patterns.

16. A negative or positive photographic plate made with recurring patterns —as dots, lines, figures—produced by the action of different coloured light in regular alternating order, having a portion of its surface printed and developed for the purpose of registering by means of and with an opaque spot covering all lines and patterns in that spot.

17. A negative or positive photographic plate made with recurring patterns —as dots, lines, figures—produced by the action of different coloured light in regular alternating order, having a portion of its surface printed and developed for the purpose of registering by means of and with a transparent spot covering all patterns in that spot.

PHOTOGRAPHY IN COLOURS: LANCHESTER'S SYSTEM IN THE LANTERN.

MR. FREDERICK WILLIAM LANCHESTER says:

'In one method of carrying this invention into effect I arrange a grating consisting of a number of parallel opaque bars, between a photographic camera and the object to be reproduced, and as close to the latter as possible, the said bars being preferably fixed at an equal distance from one another and leaving spaces between of less width than the bars themselves. The camera is of ordinary construction and a prism is arranged in front of, or behind, the lens with its axis parallel to the bars of the grating, the dispersion of the said prism being such that, when the camera is focussed on the grating, the images of the slots form a series of spectra on the focussing screen or plate.

'When a combination of lenses is employed the prism may be arranged between the lenses, or one or both of the lenses may be ground in such manner as to produce the required dispersion.

'The bars of the grating should be sufficiently numerous to prevent the picture from being unduly broken or disjointed.

'In taking a photograph with this apparatus I preferably use an "isochromatic" plate and give a rather longer exposure than ordinarily required; the resulting negative picture contains a record of the colours of the object in one form of shaded lines of varying intensity; a print is then taken preferably on an ordinary lantern slide, which, after development, is placed in a similar or

identical apparatus as that hereinbefore described, and in the position originally occupied by the photographic plate; the coloured picture is then reconstructed by exposing the slots in the grating to a uniform source of white light, or another method may be employed in which a lamp and condenser are placed at the back of the lantern slide, the light issuing from the grating being thrown on a screen where the original colours are found to be reconconstituted.

'The hereinbefore described analysing apparatus may be employed to produce pictures showing interference colours in film backed by reflecting surface as previously used.

'In landscape photography, where the grating cannot be conveniently arranged sufficiently near the object being photographed, a pinhole camera may be employed or the lens may be considerably stopped down, in order that both grating and landscape may be approximately in focus.

'A screen may be employed to absorb the ultra-violet rays, to prevent their reaching the sensitised plate; a cell containing sulphate of quinine in solution may be employed for this purpose.

'Referring to the accompanying sheet of drawings,—

'Fig. 1 shows apparatus suitable for the photographing and reproduction of still-life studies in portraiture.

'Fig. 2 is a modification suitable for more varied work.

'Fig. 3 is an enlarged view of a portion of the grating.

Fig. 4 illustrates one manner in which a lens may be constructed to produce the necessary dispersion without the use of a separate prism.

FIG. 1

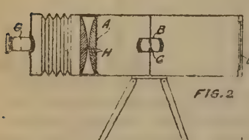


FIG. 2

FIG. 4

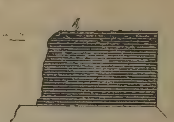


FIG. 3

'A is the grating an enlargement of a portion of which is given in fig. 3. B is the lens or combination with analysing prism, C, forming a dispersed image of the subject on the screen or sensitised plate at D; E is a colour screen as usually employed to obtain truly orthochromatic pictures, F represents a condensing combination used in conjunction with a source of light for reprojecting the picture from the finished photograph, a screen being placed close to the grating at A to receive the picture.

'In fig. 2 the picture is first projected on the grating by an additional lens combination, G, diffusion of the image being avoided by the employment of a condenser, H.'

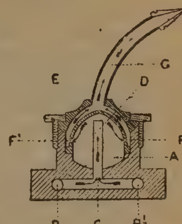
The patentee claims:—In a photographic apparatus the combination of a grating and prism.

A NEW JET.

MR. C. W. LOCKE is the patentee of this invention, which has for its object the more perfect and intimate association of the two gases in the mixing chamber by simple mechanical means, thereby increasing the power of the jet with silent burning of the gases.

The jet slides consist of two tubes connected by a suitable piece of metal at one end, which carries the jet pin; these two tubes telescope into two other tubes which are attached to the lantern body for which the jet or jets are intended, ready adjustment being thereby obtained with greatly increased steadiness of the jet, which hitherto has been impossible with ordinary tin trays.

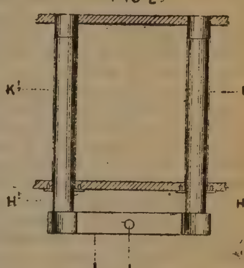
FIG 1



Mr. Locke says:—In order that my invention may be clearly rendered, reference may be had to the accompanying sheet of drawings, in which fig. 1 is a sectional view of the jet chamber; fig. 2 is a plan and part section of jet slides; fig. 3, perspective elevation of jet slides. Similar letters of reference are used to indicate like parts.

In constructing a mixed gas jet I employ the two usual tubes, B and B1, to conduct the two gases to the chamber, A; but, instead of leading the gases direct into the said chamber, they are caused to intermix underneath it, at C, and to enter the mixing chamber together through the vertical orifice, D. Over this said orifice is placed a deflecting cone, E, which causes the gases to descend and to issue into the upper part of mixing chamber, A, above the cone, E, through a number of fine perforations, F and F1, around the base of the cone; the gases are then passed on to the nozzle or burner by a tube, G, of special length and bore. In constructing the jet slides, I employ two tubes, H and H1, (fig. 2), and connect together at one end by a piece of metal, I, which carries the jet pin, J. These two tubes are made to telescope into two other tubes, K and K1, which are attached to the lantern.

FIG 2.



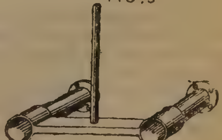
The claims are, in the case of the jet:—

1. A more perfect intermixture of the two gases.

2. The prevention of the gases reaching the nozzle imperfectly mixed, by compelling the gases to enter the chamber together through one orifice, instead of two as usually employed.

3. The vertical orifice and perforated cone, causing the gases to be split up into fine streams and finally bringing them together in the upper part of the chamber.

FIG. 3



4. Compelling the gases to travel through a longer course than usual in close association.

5. Greater intensity of light, with absolute steadiness and silence in burning.

In the case of the jet slides:—

1. The means of entirely dispensing with the usual tin lime tray.

2. The means of leaving the bodies of lanterns entirely open from bottom to top, allowing the ready escape of heat.

3. Ready adjustment, with great steadiness of the jet, which hitherto has been impossible with the ordinary tin trays.

COLOUR PHOTOGRAPHY: SELLE'S PROCESS.

The inventor of this process, Dr. Gustav Selle, of Brandenburg, thus describes his improvements in the production of 'photographs in natural colours:'—

The present known processes for producing photographs in colours are, broadly, of two kinds. In Lippmann's process, the coloured image is produced on one plate only in interference colours, whilst, in the other method, the coloured photograph is produced by superposing three single coloured images, produced with artificial colours one upon the other.

In Lippmann's process, the photography of living or moving objects seems practically excluded, on account of the necessarily long duration of exposure, whilst, in the process described in the present specification, which belongs to the second category on account of the relatively short duration of exposure, also objects which are quiet only for a short time can be photographed in colours. In this present method it is neither necessary to make for each copy of the photograph a new exposure, as in Lippmann's method, nor is the production so difficult and circumstantial as, for example, in the Vogel-Ulrich method, in which must be produced coloured plates from which printed impressions are made.

The present process is divided essentially into two parts.

1. The production of the negative.

2. The production by copying of the positive.

The production of the negative is made in the known manner by photographing an object three times, one after the other—first, behind a red; secondly, behind a green; and, thirdly, behind a dark blue, light filter.

The positive is produced by making three positives behind the corresponding three negatives, each being then coloured in the colour complementary to the light filter of its corresponding negative, and by putting these three positives one over the other.

Such a complementary positive is made by covering with a thin collodion skin, serving as image carrier, a glass plate, which is surrounded with a rim of gelatine solution, and then pouring over the same plate a chromo-gelatine emulsion.

After having dried the plate so prepared, it is exposed behind one of the three negatives, for example, the negative I. for red, then washed in cold water, and put into a colour solution complementary to red, for example, in a colour bath of methyl blue.

The plate remains in this bath until the blue image is completely developed, whereupon it is taken out, dried, and covered with collodion.

In the same manner a second positive is produced by exposing a second glass plate prepared in the same manner behind the negative II., taken with the green light filter. This is now developed in a colour bath complementary to green, for example, in one of fuchsin, and finally treated exactly as the blue one.

In the same way is produced behind negative III. the positive III., which

is developed in a colour bath complementary to blue, for example, in one of helianthin.

When all three positives are produced, they are superposed as follows :—

The edges of the rose image II. are cut, and a transfer paper is squeezed upon it ; the thin collodion skin is taken off with the paper, and transferred upon positive I. (blue), which has been previously covered with gelatine as adhesive substance, the two images are put one upon the other, pressed together, and transfer paper is taken off. In the same way the positive III. (yellow) is transferred on the upper of the other two, and a positive in natural colours is thus produced, which consists of collodion or other thin skins, and can be easily transferred to a permanent support of paper, opal, glass, &c.

The inventor's claims are for : 1.—A positive process for producing coloured photographs, comprising the employment of very thin but transportable collodion skins as image-carriers, which are treated with chrom-gelatine emulsion, whereupon, after exposure behind corresponding negatives, the soluble salts are washed out in cold water, and the image made sensitive in this manner for colour baths is developed in corresponding colour baths. 2. In the method described in Claim 1, the production of photographs in natural colours in the known three-colours system, by putting single coloured collodion skins produced according to Claim 1 one upon the other.

COLOUR PHOTOGRAPHY : JOLY'S TRANSLUCENT COLOURED SCREENS.

In describing his invention of translucent coloured screens for use in his process of 'colour photography' Dr. Joly says that fine silk threads or other suitable filaments, dyed or otherwise, given the required colours, are laid down upon a support of translucent or transparent glass or on some other support through which light can pass, as, for instance, a frame with a central opening ; the filaments are imbedded in or otherwise treated with varnish or other translucent adhesive medium, serving to impart translucency to the filaments or to increase any translucency they may originally possess, and to cause them to adhere to the surface of the support and preserve them from injury. The filaments are preferably laid parallel with each other and in contact. In this way a multi-coloured screen, consisting of a pattern of fine translucent or transparent parallel lines, can be obtained. Thus, red, green, and blue filament may repeatedly succeed each other upon the support. The colours employed need not, however, be red, green, and blue ; they may be any colours suitable for taking or for viewing the image by the particular process of colour photography in which they are used, or they may be such as will serve both for taking and viewing the image, or two colours, or four or more colours, for special colour effects, may be used.

The glass plate or other support may be coated before, after, or during the deposition of the filaments thereon, with the aforesaid varnish or other suitable adhesive medium ; this medium should preferably be of as nearly as possible the same refractive index as the filament. It may consist of a crystal varnish made of any suitable resin, or of a varnish of Canada balsam in a suitable solvent, or of dextrine, collodion, gum arabic, gelatine, or the like. When any medium which is not waterproof, such as dextrine, for example, is used to receive the filaments or attach them to the plate, I may subsequently apply a coating of waterproof varnish to the surface of the non-waterproof layer, in order further to protect the filaments.

The colour, if carried as a dye upon a silk filament, should preferably be imparted to the filament before the latter is placed on the support.

The filament may consist of ten, twenty, or more constituent silk fibres, or fibres of artificial silk, or of a less number, or of one fibre according to the width of the line of colour required in the screen.

The several coloured filaments may be brought together from reels before being applied simultaneously to the surface of the support, but so as not to mingle together or overlap one another. Thus one reel may supply red, another green, and a third violet filaments, or several reels carrying each a single-coloured fibre, or more than one fibre, may be used to make up each line of colour on the support. Thus there might be five or ten reels of green fibre to build up the green filament.

The filaments may be prepared so that the individual fibres thereof are held together by an adhesive material till they are laid upon the support; this adhesive material is then dissolved out or melted to fluidity, or it is so chosen as to be soluble in a medium previously laid upon the plate.

Thus, if the fibres are coated or retained together by dextrine, this will dissolve in a solution of dextrine previously laid upon the plate; or the filaments may be of one fibre each, and these may be of silk or artificial silk of the required dimensions; or a filament of one colour only may be laid down at one time to be succeeded by the other colours applied immediately or subsequently. I may use other material than silk for the filaments; for instance, glass, cotton, or celluloid in the form of fine filaments, artificial silk, especially drawn silk gut, or other suitable threads or fibres, natural or artificial.

The several filaments or threads may pass through a bath of varnish, dextrine, or alcohol, or other suitable medium before reaching the plate; this medium serves either to retain in coherence, or wash or desiccate the fibres of which the filaments are constituted, or the filaments may be desiccated by being passed over a heated roller before reaching the support.

A burnished roller, smooth straight-edge, or soft pad may be drawn along the freshly deposited filaments immediately after their deposition pressing them against the support, serving to smooth them down, straighten crooked fibres, and expel air from them when they are applied wet or on a varnished support. A smooth blade or guide may also be provided to run along the outer edge of the freshly deposited filament to smooth the edge of the same and press in any projecting fibres.

After the support is completely supplied with filaments and varnish it may be pressed, when the varnish is nearly dry, against a flat, hard, polished surface, in order to confer a smooth surface upon the facing of filaments and varnish.

To secure the required regular deposition of filaments on the support, I may adopt any of the following contrivances:—

The filaments can be received upon a polygonal cylinder or drum, upon the faces of which may be attached a convenient number of the translucent plates or other supports; or the drum is cylindrical and wrapped round with celluloid or other flexible support, upon which it is desired to deposit the filaments. This cylinder or drum is rotated uniformly before the nipple delivering the threads, and, simultaneously with its rotation, it is displaced in the direction of its axis at a uniform rate. Or the drum rotates on fixed bearings, while the support carrying the nipple, or both the nipple and reels, is displaced longitudinally. In the first case, a screw carried upon a prolongation of the axis of the drum, and engaging in a fixed nut, will cause the drum to be displaced longitudinally in its bearings simultaneously with its rotation. In the second case, the support carrying the nipple, or both the nipple and reels, may be provided with a nut which engages with a 'leading screw' geared suitably with the rotatable drum. Or, instead of the cylinder or drum, a frame carrying two supports only, placed back to back, may be employed for a like purpose. In the foregoing apparatus the supports may be stationary, and the reels and nipple may be carried round the drum or cylinder, simultaneously advancing parallel to the axis of the drum. In screens produced by such devices, the lines of colour are short lengths of spirals.

It is convenient, when a sufficient number of filaments have been laid on the frames, to apply adhesive material to them at the edges of the frames to attach them to the latter, and, when this is hard, the frames can be severed from one another.

A machine of the nature of an ordinary ruling machine, in which the pen or graving tool is replaced by the nipple delivering the silk, may be used to deliver the filament instead of the rotary devices previously described. A large screen may thus be coated with filaments. At the completion of each line the filament may be laid reversely to form the next line, a line being thus laid at each stroke of the machine.

Or the filaments may be first brought into a warp of parallel threads, in the correct alternation or order of colours, somewhat in the manner in which the warp is made ready for the weft in the practice of weaving. Against this warp the support is applied, carrying varnish or some other adhesive medium in a tacky or wet state upon its surface, so as to engage with and retain a series of parallel filaments. Or the varnish can be applied after a dry support has been applied to the web. Or the individual, separate coloured filaments may be caused to take the correct positions for the formation of a warp by placing properly disposed notches on the opposite sides of a warp-straining device, and then applying the support to the filaments thus stretched, these latter being caused to adhere to the support by an application of varnish.

I may use filaments of only one colour on each warp-straining device. In this case the said device may be provided with regular indentations on the edges, serving to guide the filaments to the correct position. For three filaments the notches on the warp-straining device would be at a distance apart equal to double the width of one filament, so that sufficient space remained between every two adjoining filaments to subsequently receive two other filaments. In the winding of such devices, which may be effected on rotatable carriers of the kind hereinbefore described, I may dispense with accurate leading screws for the carriers or other rotating appliances, relying upon the regular spacing of the aforesaid notches. The three several webs so obtained may then be successively applied to the support, or may be applied thereto simultaneously if the devices are of such dimensions that one may be fitted into the other, so that the three series of filaments will come properly into the one plane.

I may also weave the filaments into a fabric to be applied to the support, the coloured threads forming the warp, and the weft consisting only of a sufficient number of colourless threads to cause the threads of the warp to retain their proper relative positions until they are secured on the support.

In the foregoing methods of depositing the silk or other filament, more than one nipple, each delivering the complete set of colours, or each delivering but the one colour, may be used.

In any of the machines hereinbefore referred to, I may introduce an automatic arrangement whereby the machine will stop running in the event of a thread breaking, or whereby notice of such breakage will be given by the ringing of a bell.

In place of using ready-manufactured or natural filaments I may prepare these immediately before their application to the plate. Thus filaments of rapidly drying material, such as artificial silk, may be expelled or drawn from minute perforations communicating with a supply of the viscous substance suitably dyed.

Dr. Joly's claims are: 1. A screen for use in colour photography consisting of translucent coloured filaments. 2. In a screen for use in colour photography, the combination of translucent coloured filaments with means for retaining them in the desired position relatively to each other. 3. In a screen for use in colour photography, the combination with a 'support' of a series of translucent coloured filaments carried thereby, and means for

retaining those filaments in place relatively to the support. 4. In a screen for use in colour photography, the combination with a 'support' of translucent coloured filaments, and a coating of adhesive material to protect them from blows or from the action of moisture and keep them in place. 5. In a screen for use in colour photography, the combination with a 'support' of coloured filaments carried thereby, and rendered translucent by being impregnated with varnish or the like. 6. In a screen for use in colour photography, the combination with a 'support' consisting of a sheet or plate of translucent material of translucent coloured filaments carried thereby. 7. In a screen for use in colour photography, the combination with a 'support' of a single translucent coloured filament in a series of turns thereon. 8. In a screen for use in colour photography, a warp of coloured translucent filaments having a weft of colourless filaments. 9. A method of manufacturing translucent coloured screens which comprises the operation of winding the translucent coloured filament or translucent coloured warp helically upon a carrier, whereon the 'supports' for the filament are placed. 10. A method of manufacturing translucent coloured screens, which comprises the operation of delivering a coloured filament or more than one coloured filament from a delivering device into the desired position on a 'support' by reciprocating the said device relatively to the support, or *vice versâ*. 11. A method of manufacturing translucent coloured screens, which comprises the operations of forming a warp of coloured filaments and laying against it an adhesive 'support' to engage such filaments, or laying against it a 'support' to which an adhesive material is subsequently applied.

PHOTOGRAPHING ANIMALS TO SCALE.

MR. W. I. CHADWICK'S plan of utilising photography for the purpose of obtaining photographs of animals taken to scale is described by himself as follows:—

As is well known, photographs of animals are practically useless for purposes of measurement, owing to the effects of perspective, ignorance of the distance of the point of sight, and the general absence of comparison with objects of known dimensions. The object of my said invention is a definite process of procedure having known conventional constants, and the introduction of a comparison scale into the photographs for purposes of measurement or estimation of the dimensions of the animal.

For example, in making photographs of horses according to my said invention, I use a lens of known focus, fixed at a known height above the ground and at equal or proportionate distances from certain fixed marks in the ground. The horse is brought in front of the lens and over the indicating marks on or in the ground. The position of the horse's feet with respect to such marks is noted either by eye observation or by examination of the photograph.

Subsequently, with the lens still in the same position with regard to the indicating marks, a screen, having horizontal and vertical bars, subdivisions, or graduations, is placed on the line running between positions previously occupied by the fore and hind feet of the horse. A photograph of this screen is taken, and by doubtle printing, superposition, or combination, the two photographs of the screen and the animal are combined into a single photograph. Owing to the procedure adopted, the vertical plane of the screen will coincide with a vertical plane through the spine of the animal, and, partaking of the same effects of perspective projection, the contour of the animal may be quantatively noted, and reliable comparison of what are known to breeders as 'points' may be made between photographs of animals taken at different times and places. According to a modification of my said invention, a screen or graduated framework is placed about the animal in a plane passing through its spine, and is photographed simultaneously with the animal.

SEAMAN'S PRINTING FRAME FOR STAMP PHOTOGRAPHS.

Mr. Edward Seaman has patented a printing frame to print twelve photographs, each one inch by three-quarters of an inch, on one piece of prepared photographic paper three inches square. The frame consists of two slides. One contains a hole, one inch by three-quarters of an inch in size, which is the size of the photographs, made in such a manner that a negative may be fixed behind it; the other slide contains a hole three and a quarter inches square. The paper is laid on a ledge, which goes round the hole, and fixed by means of the back. The slides are grooved, so that when fitted together each one may be moved to and fro. By this movement the paper is brought into position behind the negative, and is exposed by the frame being held up to a light. The slide is moved again to change the position of the paper, and then it is again exposed. This is repeated until twelve exposures have been completed, thus producing twelve separate photographs on one piece of paper.

A SIMULTANEOUS PRINTING AND TONING PROCESS.

This is the invention of Messrs. Paul Emil Schoenfelder & Emil Kehle, who state that its object is to provide a chemical compound or composition for the preparation of paper, especially glazed paper, porcelain, or any other suitable material, on which photographic prints are to be made from a negative plate, whereby the toning of the picture is accomplished simultaneously with the printing, and thus the subjecting of the print, after it is made, to a separate toning bath, is avoided.

The composition consists of the following ingredients, combined in the proportions stated, and which we will call stock or ground solutions, viz. :—

Stock Solution A.

Collodion.

Pyroxyline	300 grains.
Ether	1 pound.
Alcohol (absolute)	1 ,,

Stock Solution B.

Fifteen grains of chloride of a metal of the platina class, such as chloride of gold, of iridium, of rhodium, of osmium, of palladium, or of platinum,

Said fifteen grains of chloride being dissolved fn half an ounce of alcohol (forty per cent.).

From the stock solution A one and a half ounces is thoroughly mixed with ten drops of stock solution B, and the following ingredients are added in the proportions stated, viz. :—

(*a*) Three grains of an organic acid, such as citric acid (tartaric acid, formic acid, &c.), which is dissolved before mixing with the other ingredients in three drops of alcohol.

(*b*) Fifteen grains of nitrate of silver, or its equivalent, first dissolved in fifty drops of forty per cent. alcohol.

(*c*) One and a half grains of a chloride—such as chloride of strontium, or of barium, or of zirconia—dissolved, before mixing with the other ingredients, in three drops of forty per cent. alcohol; and—

(*d*) Two drops of a softening chemical, such as glycerine or castor oil.

The above emulsion is applied to the surface of the material on which the picture or photograph is to be printed.

The surface must be thoroughly dried before using.

After the print has been made, it is given a bath in a solution of hyposulphite of soda, one part to fifteen parts of water, in which bath it remains until all superfluous chemicals have been removed from the picture (about five minutes), when it is taken out and thoroughly washed in clean water.

The picture is then ready for mounting, and does not require any additional toning, as the toning has been accomplished simultaneously with the printing, and it has a superior finish, that will not fade or turn yellow by being exposed to light.

In place of stock solution A, a solution can be used composed of gelatine one part and water three parts, in which case the ingredients mentioned under *a*, *b*, and *c* are dissolved in water instead of alcohol.

The claims are :—

1. A chemical composition to be used for preparing the surface of suitable material for photographic purposes, consisting of a chloride of metal of the platinum class, of nitrate of silver or its equivalent, a holding subtsance, and an organic acid, such as citric acid.
2. A chemical composition to be used for preparing the surface of suitable material for photographic prints, consisting of a salt of a metal of the platinum class, of nitrate of silver or its equivalent, a holding substance, such as collodion, an organic acid, such as citric acid, and glycerine or its equivalent.
3. A chemical composition to be used for preparing the surface of suitable material for photographic prints, consisting of a holding substance, such as collodion, a salt of a metal of the platinum class, of nitrate of silver or its equivalent, a chloride, such as chloride of strontium, a softening ingredient, such as glycerine, an organic acid, such as citric acid.

FRIESE GREENE'S IMPROVEMENTS IN RAPID PRINTING BY PHOTOGRAPHY.

The following is a brief description of Mr. Friese Greene's improvements in the production of prints by photography, and in apparatus for the purpose :—

I print successively by means of photography a number of impressions from the same photographic or other negative, or from the same series of negatives, upon a continuous band of sensitised paper or other sensitised material, as this is caused to travel continuously in contact with a translucent cylinder which bears or carries the negative or negatives, the said cylinder being lighted internally, preferably by one or more incandescing electric lamps.

In carrying out the invention, when the negative or negatives employed are photographic negatives, I use negatives which have been taken upon a flexible translucent material such as a thin sheet of celluloid, and I place this sheet upon a supporting cylinder of glass in such manner that the sheet bearing the negative or series of negatives surrounds the cylinder. Within this cylinder I place one or more lamps. Over or under the cylinder, and in contact with the celluloid sheet thereon, I carry a band of sensitised material from a roll or otherwise, this band being so guided that there is always a part, say, several inches, of its length in contact with the celluloid sheet and this part of the band being maintained taut. Rotary motion is given to the cylinder and forward motion at the same surface speed to the band, with the result that every section of the band equal to the circumference of the cylinder has printed upon it by means of the light a positive impression from the

negative or negatives on the cylinder, the same picture or pictures being produced upon every successive section of the band. On leaving the cylinder the band is carried to and through fixing and developing baths; or, if it be required to print upon both sides of the band, it goes from the first cylinder to a second and similar cylinder, where it is printed in like manner upon its second side; it then passes on to the fixing and developing baths.

When the negatives employed are not photographic negatives, they may, for example, be transparencies or sheets having the parts that do not constitute the design in black, red, or other non-actinic colour, and the other parts, that is to say, the design transparent, or *vice versâ*.

It is not essential to employ the glass cylinder described if the sheet that bears the negative or negatives is strong enough to be self-supporting.'

WELLINGTON'S IMPROVEMENTS IN THE MANUFACTURE OF STRIPPING FILMS.

MR. J. B. B. WELLINGTON says:—

'Hitherto stripping films have been formed by interposing between an insoluble gelatine and a paper backing a layer of soluble gelatine, which was, after development and prior to the process of printing, dissolved by means of hot water, thus releasing the negative from its temporary support. In films of this class the insoluble gelatine was so thin that it was necessary to transfer it to another permanent transparent support, this transference forming a necessary part of the process. Stripping films of this kind were found to be unsatisfactory in various respects, and the process is now no longer to be met with in practice.

'In stripping films manufactured according to my invention the disadvantages hitherto obtaining are overcome. The stripping is effected without the use of hot baths or special treatment of any kind, and it is not necessary to transfer the stripped film to any other support.

'In carrying my invention into effect, I coat upon one or both sides of any suitable paper, as, for instance, upon the well-known photographic papers, and also those coated with baryta, whether matt or calendered, a substratum containing a suitable proportion of any gum or resin dissolved in any of the well-known solvents which are in general use for this purpose. In practice I have found that good results may be obtained with mastic, and this in varying proportions, or with other gums and resins, as, for instance, damar, copal, and their congeners, but I prefer to use gum sandarac or gum copal. The thickness of the solution of these gums is, in like manner, capable of considerable variation, and will depend in great measure upon the means which are adopted for coating the paper. For instance, if the paper be coated by immersion in a trough, a solution of one part of gum sandarac or gum copal and ten parts of methylated spirit or other solvent will be found to answer well. The gum solution may, if desired, be stained with some non-actinic colour, in order to prevent the transmission of light through the film and to diminish halation.

'Having thus prepared my paper backing by coating it with a substratum of gum, and permitted it to dry, I proceed to coat thereupon the layer of gelatine which is destined to form the body of the film itself. This body I form of gelatine, which I preferably render insoluble by the addition thereto, immediately prior to coating, of a suitable proportion of soda, alum, chrome alum, or any of those well-known chemicals which have the property of rendering gelatine insoluble when dry. I coat the gelatine upon the gummed paper backing in sufficient thickness to give me, when dried

and stripped from the gummed paper, a film of sufficient substance to serve as the support of a negative. In practice, I prefer to make the gelatine so thick that the resulting film, together with the emulsion spread upon it, measures from 2000ths to 10,000ths of an inch in thickness when dry, in order that it may not be necessary to transfer the film to another support. If it be desired, the paper backing may be coated with the gelatine upon both sides, the coating upon the back in such case having for its purpose to prevent the warping and cockling of the entire support through change of temperature and hygroscopic conditions. When the gelatine is dry, I coat upon it the sensitive emulsion in the manner well known to those skilled in the art. This process completes the manufacture of the film.

'If desired, the silver salts may be emulsified with the gelatine used to form the body film, in which case the body film and sensitive surface are produced at one and the same operation, thus avoiding the loss of time involved in the double process and the intermediate drying operation.

'I expose my improved film while still in contact with the backing of gummed paper upon which it is formed, this backing giving body and rigidity to the film, which is advantageous. In like manner I preferably effect the process of development, fixing, and washing upon the paper backing. When the washing is complete, or at any stage of the process after exposure of the film, I separate or strip the body film of gelatine, together with the emulsion coating upon it, by pulling off the backing of gummed paper, the function of the gummed substratum, in which lies the essence of my invention, being to facilitate the stripping process. Having thus separated the negative with its permanent support, I preferably squeegee this upon a ferrotype plate, sheet of glass polished by means of French chalk, or talc, or with wax, or other similar plane and polished surface, upon which it is permitted to dry, and from which it derives a flat and polished surface. The negative may be squeegeed with either surface in contact with the polished plate. Should it be desired to remove any grain or matt appearance of the paper backing which may appear upon the gelatine body, this side may be placed for this purpose in contact with the polished plate. When the negative becomes thoroughly dry, it is peeled from the polished surface, and is then ready for printing.'

NEGATIVES FOR PRINTING PURPOSES.

THE patentee, Mr. A. W. K. Bryan, says:—

To accomplish this, and to effect my improvements, I provide a special negative of glass or film, which I cause to be reticulated by transparent lines on an opaque ground to form a screen.

These reticulations may be formed upon the special negative by hand, or they may be developed thereon by photography from lace, muslin, or other reticulated objects or surfaces, or by other means, as may be found most suitable.

This special screen is then placed in any convenient manner upon or close to an unexposed sensitive plate, which plate is required ultimately to form the screened negative desired, and the screen thus covering the plate is afterwards exposed to the light, by which means (light being enabled to penetrate to the sensitive film of the photographic negative through the transparent lines only) a partial exposure of the sensitised plate, acting in the form of the reticulated lines, is effected.

The sensitised plate is then employed in the camera in the ordinary manner, the result being that a photograph is taken upon a reticulated or screened plate in lieu of the plate which is sensitive over its entire surface.

By this means a screened negative is produced without the employment of

gauze or other like screens in the camera, and greater facility in operation is thereby obtained.

Variations in detail, such as the manner of reticulating the negative screen together with the form of the reticulations, may be made without departing from the peculiar character of the invention.

The claim is :—In the production of negatives for photographic 'process' engraving, a special reticulated negative for the purpose of producing reticulations by exposure upon the surface of the photographic sensitised plate.

IMPROVEMENTS IN ALBUMEN PRINTING PAPER.

HERR GUSTAV KOPPMANN, the patentee of this process, says :—

It is a well-known fact that the albumenised papers used for photographic positives lose their beautiful rose or bluish tint after a short time. Hitherto the proceeding consisted in mixing the corresponding colour solution with the albumen, covering the paper with this mixture. The colours used are the little light-proof aniline colours, mixing perfectly with the albumen.

The above proceeding will be replaced by the following one of my invention, obviating the above-mentioned inconvenience by a more intimate combination of the dyeing material with the paper.

According to the proceeding of the applicant it is not any longer the solution of albumen which is coloured, the paper to be used being, on the contrary, evenly dyed with a layer of colour by an ordinary printing procedure. Hence the colour is brought into direct contact with the surperficies of the paper, wherein precisely consists the innovation, and thus a possibility is given to employ a colour known as indifferent to light, as, for instance, cobalt blue.

It is only after submitting the paper to this printing procees that it is covered with albumen, and afterwards treated in the known manner, and then it is ready for being sensitised with the solution of nitrate of silver.

The above proceeding need not be limited to albumenised paper, but may be adopted wherever a constant ground colour is desirable for photographic positives.

The innovation of the proceeding consists consequently in the separation of the coloured solution, for the production of which a light-proof metallic colour, or any other as light-proof known suitable colour is made use of, from the albumen layer proper and its previous appliance.

The claim is for a coloured positive paper, wherein the coloured tint is produced by a light-proof coloured raw paper.

MENDELSSOHN'S MEANS FOR PRODUCING PHOTOGRAPHS RESEMBLING ENGRAVINGS.

MR. H. E. MENDELSSOHN says :—By my invention I am enabled to produc photographs and photo-engravings possessing the appearance of high-class engravings. That is to say, the prints will contain the lines, dots, or stipples usually found in engravings, and will, moreover, retain all the half-tones of the original negative. This result is accomplished by forming a compound negative, which consists of an original negative and of a printed gelatinous coating intimately secured thereto, and by printing from such compound negative.

In carrying my invention into effect, I proceed as follows :—

1. I produce a copy or print on paper from an engraved or etched plate

lithograph, zincograph, or electrotype, containing in negative lines, dots stipples, or other pattern that usually appears on an engraving. From the copy or print thus obtained a negative is taken in the usual manner.

2. I also form a mixture composed of about—

Gelatine (soft)	30 ounces.
Sugar	12 ,,
Water	90 ,,

to which is added, after the gelatine is dissolved, about 1 to 6 drachms of Indian ink. This mixture is spread upon a sheet of photographic or any other paper, and, after it has thoroughly set, it is sensitised by immersion in a bath composed of about—

Potassium bichromate	3 ounces.
Ammonium carbonate	70 grains.
Water	100 ounces.

The backed and sensitised gelatinous film is thoroughly dried and cut up into proper sizes.

3. The films formed in the above manner are exposed to light under the negative containing the lines, dots, or stipples, the exposure being timed preferably by an actinometer. After proper exposure, the print is immersed in cold water to become soft.

4. I take an ordinary negative produced in the usual manner, and from which a print containing my novel effect is to be obtained. This negative is coated with a solution composed of about 95 parts of turpentine, and five parts of resin, and is allowed to dry.

5. The negative is immersed in cold water, and its face is brought into optical contact with the printed gelatinous film. All the water is expelled between the two surfaces by the pressure of a squeegee, and after a few minutes the film will have set and united with the negative. The negative is in this condition placed in a tray containing water, which is heated to about 85° to 140° F. After a short time the paper backing will become loosened and may be drawn off. The negative is now washed until all the gelatine which has not been affected by the light, and has consequently remained soluble, is washed away. Those particles of gelatine, however, which have been affected by light, and have thereby been rendered insoluble, will not be affected by the washing, and will remain inseparably united with the negative, The result will therefore be a compound negative, A, composed of a reticulated, translucent, gelatinous coating, *a*, containing lines, dots, and stipples, and of an original negative, *b*, to which such coating is intimately secured.

6. From this compound negative the pictures are now printed in the ordinary photographic manner on photographic paper, or other substance, and will have the appearance of finely executed engravings. Owing to the exceeding thinness of the film, its reticulated condition, and the fact that it is inseparably united to the negative, none of the details or half-tones of the negative are lost by the transmission of light through the film while printing, and therefore the product will possess a high artistic value.

The process above described is to be practised when the gelatinous film is to be used shortly after the lines, dots, and stipples have been printed upon it. Such a film when stored would, after a time, become insoluble in all its parts, and thus could not be used in the manner described. In order to produce a permanent printed film, which forms a new article of merchandise, and which may be used at any convenient time, I proceed as follows: A backed film containing printed lines, dots, and stipples is formed in the manner already

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described, but, in lieu of being attached to a negative, it is attached to a shee of transfer paper made as follows: A sheet of smooth, white paper of sufficient strength is immersed in a saturated solution composed of—

Unbleached shellac	4 parts.
Powdered borax	4 ,,
Hot water	35 ,,

After being removed and dried, the paper is rubbed over with a composition consisting of about—

Wax	1 part.
Rosin	1 ,,
Turpentine or benzoline	50 parts.

The gelatinous film is brought into contact with the transfer paper in a cold-water bath, and a squeegee is applied to expel the water, and intimately connect the film to the paper.

The product is then placed in a hot bath, the backing removed, and the coated paper is washed until the soluble gelatine is washed away, while the insoluble gelatine will remain attached to the transfer paper. This paper provided with the reticulated insoluble gelatinous coating, having the lines, dots, or stipples, is now complete, and forms a practically imperishable article of merchandise, that may be used at any subsequent convenient time.

To use this paper, I take an ordinary negative, whether produced by the wet or dry process, and coat its film side with a saturated solution of gutta percha.

The negative thus treated and the film on the transfer paper are both immersed in cold water, and are brought face to face and squeezed into optical contact with each other. When the compound plate thus produced has set, and become thoroughly dry, the transfer paper may be drawn off. The transfer paper comes off with the slightest pull. This is due to the fact that, on drying, the waxed paper will contract and pucker up, so that it becomes practically detached. Thus a compound negative is formed, which consists of the original negative and of the inseparable reticulated gelatinous coating containing the lines, dots, or stipples. This compound negative is, therefore, a substantial equivalent of the negative produced by my first-described process, and, when printed from, will produce a picture resembling a high-class engraving.

By my invention I may also produce prints containing a variegated pattern. Here part of the print, such as the face, contains the dots; another part, such as the background, contains the lines and another; part, such as the figure or drapery, contains the stipples.

To produce this print, I must, of course, first obtain a compound negative, which I make in the following manner: Sheets of transfer paper are first made in the manner described, some containing a gelatinous coating with dots only, others, a gelatinous coating with lines only; and others, a gelatinous coating with stipples only.

The negative is then prepared with the gutta-percha solution as described, but, in place of coating the entire surface, I brush such solution only over a certain part of the negative, say the background. I also moisten the film containing the lines only, and bring it into contact with the negative, in the manner already previously described. When the negative is dry, the transfer paper is removed, and the film containing the lines will thus be attached to that part of the negative only which had been brushed over with the gutta-percha solution.

In a similar manner a film containing the dots only is attached to the face of the negative, and, finally, a film containing the stipple only is attached to the figure or drapery of the negative. Thus a compound negative is formed,

having different patterns on different parts, and producing a correspondingly marked print of fine effect.

Another way to obtain a variegated negative or positive is to cut out masks corresponding to the head, drapery, background, &c., of the picture. These masks are placed on the negative or positive containing lines, dots, or stipples, and printed. The result will be a print containing only that part of the picture corresponding to the mask. This is brought into contact with the negative, in the manner above described.

By my invention I am thus enabled to form photographic prints resembling finely executed engravings. The reticulated gelatinous coating adhering intimately to the negative offers practically no resistance to the light, and thus the prints will show the pattern of the superposed film and also the full beauty of the negative, as none of its half-tones will have been obscured or impaired.

PHOTOGRAPHS IN RELIEF IN GOLD, SILVER, AND OTHER MATERIALS.

MESSRS. HILL & BARRATT are the patentees of this invention, which relates to the making of photographs in true relief, either in plaster or other plastic material, or in metal by electro-depositing.

The process in the first stage depends on the well-known action of light on bichromated gelatine, in rendering it insoluble and incapable of absorbing water, and is to obtain a simple method of obtaining higher relief, and also, in the case of portraiture, to correct the false modelling which in most cases is present.

In the case of side-lit portraits with black backgrounds no preparation of the negative is necessary, nor from copies of wash drawings where the background is the darkest part.

In the case of an ordinary portrait false modelling may occur, as light in this process takes more note of colour than form, for instance, a portrait in which the hair is dark; the modelling of the face would be rendered correctly, but the hair would appear in the relief to sink into the head, and the background, if light in colour, would not recede sufficiently to throw the head into high relief.

To overcome this difficulty, the background is painted on a print from the negative, with black pigment, and the lights on the hair accentuated with a white pigment. An alternative is to make a thin negative, intensify with uranium, and reduce where necessary with strong ammonia.

The method we prefer to work is to coat a piece of plate glass (which has been well rubbed with talc) with gelatine, to which may be added proportions of sugar and citric acid to render the gelatine flexible; this is dried gradually to prevent reticulation. The mixture when dry is stripped from the glass, and is then sensitised in a solution of bichromate of potash (preferably two per cent.).

It is then exposed to the action of light under the negative; the gelatine, being flexible, can be readily examined to watch the progress of printing.

When sufficiently printed it is firmly cemented to glass, with an adhesive which swells in the same proportion as the gelatine. We prefer the use of isinglass dissolved in weak acetic acid, to which is added a small proportion of celluloid dissolved in amyl-acetate.

The plate thus formed is soaked in water, and the gelatine will swell where not acted on by light, and a photograph in very low relief in gelatine is obtained.

When all the bichromate is soaked out, the gelatine relief is plunged into weak acid, preferably citric acid, in the proportion of one part of citric acid to six of water by weight, or citric acid may be well rubbed into the surface, and is then transferred to cold water.

The gelatine, not being able to swell laterally, owing to its being cemented to glass, expands vertically, but only when still absorbent to water; when the gelatine has been acted on by the light, the acid will not penetrate. The increase by this treatment is from two to four times the relief originally gained.

From the swollen gelatine thus obtained, plaster casts may be taken, or copper may be deposited direct if the surface is rendered conductive by the use of any of the well-known agents, such as bisulphide of carbon and phosphorus followed by nitrate of silver solution.

The patentees claim:—

I. The correction of the print or negative as hereinbefore described, or by retouching on the negative.

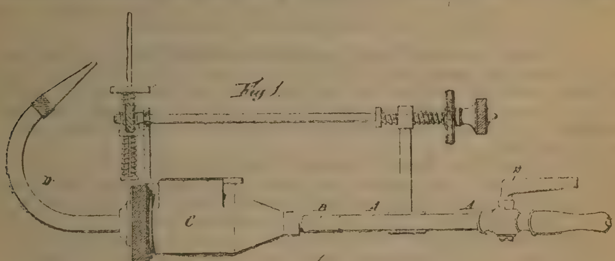
II. The vertical expansion of a gelatine relief, by means of an acid, preferably citric.

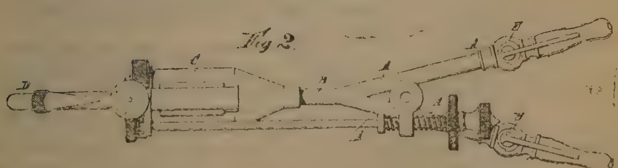
III. Photographs in metal, or plastic material from gelatine reliefs.

GWYER'S IMPROVED MEANS FOR THOROUGHLY MIXING GASES FOR THE LIME LIGHT.

MR. GEORGE WRIGHT GWYER says:—According to the usual method of producing a mixture of oxygen and oxy-ether gas, the gases are forced through separate pipes into a circular casing or chamber in which they become imperfectly mixed just prior to passing to the jet nipple.

The object of my present invention is to improve the mixing, for which purpose I connect the two supply pipes, A, A, as shown in the annexed drawings (fig. 1 side elevation, fig. 2 plan), to a single branch, B, which is





attached to a mixing chamber or vessel, C, of long, rectangular, circular, or equivalent shape, and preferably coned at the juncture, from the opposite end

of which vessel, C, a curved pipe, D, projects, with a nipple end in line with the lens.

By this invention the gases from the two pipes, A, A, strike each other at the junction of the branch, and flow along the branch in a partially mixed condition, and then become thoroughly and completely mixed in the chamber or vessel, C, before passing through the curved pipe, D.

The introduction of ether saturators has rendered necessary an improvement in the mixing of the ether gas with the oxygen. The specific gravity of the gas being more than the hydrogen formerly used, more thorough mixing is required to get good results. This is usually accomplished by increasing the size of the existing circular-shaped mixing chamber. There is, however, a limit to the size of the mixing chamber, because the nipple must not be above the middle of the lenses of the condenser.

By placing the jet horizontally, it enables a great length of mixing chamber to be obtained.

Instead of carrying oxygen and oxy-ether gas in separate pipes to the mixing chamber as formerly, the gases commingle as soon as they enter the branch before they come to the mixing chamber, and a cock, E, can be placed that both the oxygen and the oxy-ether gas, or either of them, can be cut off at once, or regulated, an important feature to a lanternist when he sees that the ether in his saturator is getting exhausted.

The claim is for connecting two supply pipes, A A, of a saturator of the kind described and shown to a single pipe, B, in which a partial mixing of the gases can take place prior to passing into the mixing chamber, C, for the more complete saturation, admixture, commingling in proportional quantities, for improving the action on the lime at the point of combustion.

OAKLEY'S ANTI-HALATION SUBSTRATUM.

MR. C. F. OAKLEY says that for the purpose of preventing halation it has been proposed at various times during the last six or eight years to coat the glass plate, film, or other support for the sensitive emulsion, with a layer or substratum below the sensitive emulsion, this layer or substratum containing a colouring matter which renders it non-actinic, the said colouring matter subsequently disappearing during the development or fixing. But these coloured substrata have failed to answer in practice, because the colouring matters which they contain are of such a nature that they become, to a great extent, taken up by the superposed coating of emulsion, the sensitiveness of which is consequently seriously impaired and sometimes practically destroyed.

It has also been proposed, with the object of preventing halation, to coat the glass plates, or other supports, with two or more coats of emulsion of graduated degrees of sensitiveness.

'Now, the object of my invention is to cover the glass plate, or other support, with a layer or substratum coloured with such a material and in such a manner that the colouring matter will not be subsequently taken up by the sensitive emulsion applied to the plate over the substratum, the sensitiveness of the emulsion therefore not being affected.

'My invention consists in the manufacture of photographic plates and films by first coating the glass plate, or other support, with a solution of gelatine or other suitable or non-sensitive material, then immersing the plate, preferably when dry, for a sufficient length of time, say from two to five minutes, more or less, in a colouring and hardening solution; then, after washing the plate and allowing it to dry, coating it with a sensitive emulsion. The coating of sensitive emulsion should be allowed to dry in a dark room. The colouring and hardening solution must be one that will not only colour the layer of gelatine and render it non-actinic by entering into the substance of same, but also produce a reaction which has the effect of oxidising and hardening the

gelatine, and rendering it practically insoluble. Consequently the colouring matter is prevented from being taken up by the sensitive emulsion subsequently applied. The solution preferably employed for the purpose is permanganate of potass, and a suitable strength is obtained by adding about one ounce of the permanganate to one gallon of water.

'The colour in the non-sensitive substratum disappears during the development when developers such as hydroquinone are employed, or in the fixing bath when this contains sulphite of soda and acid.'

LUCIUM.

THE following, according to the *Chemical News*, is the draft complete specification of Prosper Barrière, of Paris, in the Republic of France, for improvements in the preparation and production of bodies for use in what is known as incandescent gas lighting.

Incandescent gas lighting, which consists in suspending fireproof luminous substances within the flame of a Bunsen burner, has been carried out hitherto in several different ways.

The illuminating properties possessed by various metallic oxides, such as those of the zirconium, lanthanum yttrium, thorium, and magnesium, have suggested the idea of making these oxides seviceable as luminous bodies.

The distinctive features of the various metallic oxides hitherto employed have been precisely determined from the points of view of both physical science and chemistry.

These oxides are derived from corresponding ores, such as thorite, cerite, gadolinite, zircons, and the like.

The treatment of these ores is a question which has not as yet been fully cleared up, and I shall not attempt to deal with it, inasmuch as my own efforts have been directed to the study of other minerals.

But the numerous experiments which I have made have enabled me to discover and to satisfy myself of the presence of a novel illuminating body (I will refer to it under the letter A) in a special ore of a sandy nature, obtainable at different places, and known as monazited sand.

This body has properties different from those possessed by the substances used hitherto.

The ore, which possesses a sandy appearance, is really rich river loam, found in small ruby-like pebbles.

The following is an example of an analysis made on a sample of this substance:—

(SiO_2) Silica	69·7	per cent.
(P_2O_5) Phosphoric acid	6	,,
(Fe_2O_3) Iron	1·92	,,
(Al_2O_3) Alumina	15	,,
Cerium, lanthanum, didymium ... about	2 13	,,
Moisture	2·05	,,
Lime, magnesia, and other miscellaneous matter ... about	2	,,
A body	1·80	,,

This new body, A, enters into the compositson of the ores named in the proportion of from 1·5 to 6 per cent., according to the sample dealt with.

Treatment.

The composition indicated above necessitates special methods of treatment having for their object to eliminate any harmful substances which the body treated may contain.

The purity of this body is the main condition upon which a satisfactory yield depends.

The ore, on having been porphyrised, is slowly melted in suitable furnaces, with an addition of carbonate of sodium in the proportion of one part of ore for every two parts of carbonate. This operation, which takes about three hours to complete, is intended to convert the oxides into insoluble carbonates.

After cooling, the powdered mass is lixiviated ; thus, by means of decantation, the elimination of the silicates and phosphates of sodium is proceeded with.

When the carbonates are exhausted by the water, they are subjected to the action of the sulphuric acid, the surplus of which is eliminated by slow calcination ; the sulphates are dissolved in cold water and precipitated by means of ammonia. The precipitate, on being washed, is dissolved in hydrochloric acid, care being taken to properly neutralise it.

The greater part of the iron and alumina is then removed by precipitating it by means of oxalic acid.

The insoluble oxalates are converted into sulphates, when partial calcination in a muffle furnace is proceeded with.

The calcination is interrupted at a certain period of the operation, which, however, can only be determined by taking into account the appearance of the material under treatment, the proper time for this being when the greater part of the acid has been eliminated. The sulphates obtained are then pulverised and put in cold water in small quantities, so that the saturation stage is, as nearly as possible, reached.

The solution obtained is then precipitated by means of ammonia, whereby magnesia and the salts of lime are eliminated. Then, by filtering, a gelatinous precipitate of oxides is obtained, which is dissolved in sulphuric acid.

The sulphuric solution obtained, having had sulphate of sodium in solution, saturated while cold, added to it, is used as a precipitating medium, there being crystals in suspension in the mass, and the saturated solutions being allowed to digest for from five to six hours, thus the group, cerium, lanthanum, didymium, is precipitated.

The double sulphates thus obtained are filtered and then thoroughly washed.

In order to remove thorium, the solution is made in sulphuric acid, and the precipitate obtained by means of sulphate of potassium.

Thus all the bodies mentioned above as being present with the A body may be eliminated.

Now the principal operation of the process has to be commenced. It consists in precipitating the solution by means of hyposulphite of sodium in the condition of a concentrated solution. This operation is started with a slight action of heat. When the boiling point is reached, the A body is precipitated first. The body obtained contains as impurities small quantities of ytterite earths, principally ytterbia.

It only remains after this to effect a most thorough washing of the hyposulphite thus obtained, using cold water for the purpose. After the washing, a solution is made in hydrochloric acid.

A reaction with sulphocyanide of ammonium will at that moment show whether there are any traces of iron left, and these, if present, may then be eliminated by the ordinary methods.

In the same way, traces of other metallic substances may be eliminated by means of a current of sulphuretted hydrogen sent into the solution of hydrochloric acid.

After precipitation by means of ammonia, the body is energetically washed with distilled cold water.

By such means a body is obtained which in itself is luminous, and which is made use of in the manner which I will now describe.

Generally speaking, the oxides employed for illuminating purposes, as well as the body to which I have referred just now, produce light which is illuminating and radiating only to a certain degree.

Radiation, which constitutes the illuminating power proper, and more particularly the brilliancy desirable in a luminous body, is obtained owing to the molecular conditions which I have found to be realisable with exceptional ease in a body which, after many trials, I have discovered to be oxide of zinc. Any other body fulfilling the same conditions may, however, be employed without departing from the principle of the inventions.

Oxide of zinc, which, upon being heated at an ordinary temperature assumes a greenish-yellow hue, when subjected to the heat of a Bunsen burner, becomes phosphorescent as it were. It is sufficient to add a small percentage of it to the illuminating solution.

I employ a nitric solution of the oxide in question.

After a fabric, which should be as fibrous as possible, has been impregnated with the said solution, when the wick thus formed has been incinerated, the decomposition of the nitrates will take place under the most favourable conditions conceivable.

Part of the oxide of zinc, the surplus thereof, is volatilised, while the remainder will be in that molecular condition referred to just now.

It is not impossible to use other oxides, which, if employed under certain conditions, and mixed or combined in a certain definite manner, and either combined or not with the body, A, may form novel bodies.

The fabric which I employ is made of special thread or filament, such as the fibres of flax, china grass, or the like, and it should have about ninety meshes per square centimetre. It is washed in a one-tenth solution of hydrochloric acid, and then with water having a slight amount of ammonia incorporated in it.

The fabric, after drying, is cut into strips of, say, twenty centimetres, and strengthened at their upper part with a strip of muslin or tulle.

Impregnation may be advantageously substituted by aspersion, by means of a special injector, which process offers the advantage of not necessitating protracted handling of the fabric, whereby certain impurities might find their way into it.

The bath employed is a nitric aqueous solution, containing as much as ten per cent. of the luminous body. Each wick should absorb at least six cubic centimetres.

After the wick has been placed on a special form of mould, it is secured to a hanger of nickel by means of an asbestos thread.

A Bunsen flame is rapidly and circularly passed round the upper portion of the said wick, while another burner is worked from below. Incineration will then take place, and the earths will form gradually. By such means a skeleton is obtained, which is placed over a burner for about half an hour in order to secure complete calcination: the wick is then in readiness for being supplied in a marketable form, and may be fitted to any burner.

The novel illuminating body which I have referred to as A, I have named 'Lucium.'

Having now particularly described and ascertained the nature of my said invention, and in what manner the same is to be performed, I declare what I claim is :—

1. For incandescent gas lighting, a new body derived from monazite sands.
2. For incandescent gas lighting, the body A, referred to in the preceding claim, in combination with a small percentage of oxide of zinc, or other body capable of imparting the necessary intensity and power of radiation.
3. The purification of the A body referred to in the first claim by treating monazite sands by oxalic acid, sulphate of sodium, sulphate of potassium, and hyposulphite of sodium.
4. For incandescent gas lighting, the combination of the aforesaid body, A (either alone or in combination with other bodies, as indicated in the second claim), with fibres or filaments.

PRACTICAL NOTES AND SUGGESTIONS OF THE YEAR.

(*Compiled from various sources by* THE EDITOR.)

Alizarine Blue Bisulphite.—Dr. Eberhard, of Gotha, continuing his researches upon orthochromatic plates, suggests bathing a Cadett lantern plate (black tones) in the following sensitiser:—

Water	100 c.c.
Alizarine blue (1 : 500)	100 ,,
Rose des Alpes (1 : 200)	2 ,,
Ammonia (sp. gr. 0 : 91)	1 ,,
Silver nitrate (1 : 40)	46 drops.

The solutions are mixed in the above order, well shaken and filtered, and the plates bathed for two or three minutes. The red sensitiveness of these plates is very high, and the strong sensitising action of the Rose des Alpes (Thiodichlortetraiodo fluorescence made by Durand, Huguenin, & Co., of Hüningen, Elsass) appears from C½ D to E, so that a very nearly closed band from the extreme red to the ultra-violet is obtained.

Aluminium Glass.—M. Leon Appert, the distinguished glass expert, has contributed to the *Moniteur de la Céramique et de la Verrerie* an able article, in which he discusses the prominent part which, he thinks, alumina is destined to play in the manufacture of glass. 'After having made numerous analytical tests of ancient window glass,' says M. Appert, 'I have arrived at the following conclusions, which appear to be of practical industrial value. The introduction of alumina into glass prevents, or at least retards, devitrification, which will occur always by the slow and repeated lowering of the temperature. The presence of alumina makes it possible that a part of the alkaline bases, soda or potash, may be replaced advantageously by an equal quantity of lime. Glass thus modified in its composition is more solid, less changeable, and more elastic. The alumina can be added to the silica without any inconvenience in a proportion not exceeding seven to eight per cent. The fusibility of glass is slightly increased thereby, while its ductility is not sensibly diminished. The only inconvenience that can arise from the use of aluminium is that it will colour the glass to some extent. This colouring does not result from the alumina itself, but from the action of the iron oxide, which is always found in it when in an impure condition. To sum up, the use of alumina, which permits its introduction only into bottle glass containing larger proportions of sand bases, should be extended equally to glass destined for other purposes, such as mirror glass, window glass, and especially drinking glasses. The quality of such glass would be greatly improved thereby. In the latter case the addition of alumina could best be accomplished if pure clay or, still better, if feldspar is used, which can be obtained at a low price. For the batch, the purest materials possible should be selected among those destined to furnish the siiica soda, and lime bases.'

Anaglyphs Perfected.—M. Louis Ducos du Hauron, the original inventor of the anaglyph, describes in the *Revue Suisse* how he has still further perfected it, so that it gives not only the idea of solidity, but also 'une sensation de polychromie complète des plus agréables.' This is a distinct advance to obtain colours and relief, and it is attained in two different ways: either by the use of two stereoscopic negatives, or by using three negatives, two of the latter not being taken stereoscopically, and printed one over the other, whilst the third fulfils the usual requirements of stereoscopic work. By the first method, the negative for the right eye is taken through a green screen, and printed in red, madder lake; the negative for the left eye being taken through a red-orange screen, and is printed in Prussian blue, the prints being viewed through spectacles with turquoise blue and ruby red glasses; this is said to give all the colours. The second method is more complicated, and is founded on the ordinary three-colour process, the two prints, negatives from which are superimposed accurately, are taken with blue-violet and green screens, and printed with chrome yellow and madder lake, the third negative being taken through an orange-red screen, and printed in Prussian blue. The same coloured spectacles are used as for the first method. This method has also been adapted to lantern projection.

A New Developer. — The *Photographisches Archiv* states that E. Ackermann has discovered that a strong reducing fluid, suitable for development, may be formed by heating in a closed vessel for ten hours, at 100 C., 2 grammes of sulphate of quinine, 8 grammes of powdered zinc, and 40 cubic centimetres of water.

A New Test for Platinum.—It may be remembered that, some little time ago, a well-known experimenter stated at a photographic society's meeting that no platinum whatever was discoverable in a print on P.O.P. toned by platinum. It is possible, however, that, if he had been in possession of a test described at the Chemical Society by Mr. Edward Sonstadt, a different result might have been obtained. Mercury, when agitated with a solution of a platinum salt, precipitates the platinum, as it does also many other metals. Perfectly pure mercury must be employed, so pure that it leaves no stain when volatilised from a white porcelain surface—the interior of a crucible, for example. The mercury should be agitated for a time with the solution of the salt, and the whole gently heated to drive off the moisture. When a greater heat is applied, the mercury is driven off and the platinum left behind. So extremely delicate is this reaction, that one part of platino-chloride of potassium in three million parts of water may be detected.

A Reducer for Chloride Prints.—Over-printed proofs on collodio or gelatino-chloride paper may be reduced by immersion in a bath of

Hypo	10 parts.
Sol. ammon. bichromate (one per cent.)	2 ,,
Water	100 ,,

A Turmeric Printing Process.—A recent writer describes this as follows: Turmeric is derived from the rhizome of two varieties of plants, *Curcuma longa* and *Curcuma rotunda;* the best kind is the Chinese, the next the Japanese, the worst the Barbadoes. Turmeric may be obtained in the form of powder, and gives up to alcohol its peculiar orange colouring matter, a solution of which on paper or metal gives a negative from a negative as the colour is discharged by light, and only by development with spirit and water, or, with long exposure, by the former alone gives positives. It can be used for zincography, photo-lithography, and three-colour printing. For zincography it is

used as follows: 10 parts of Chinese turmetric should be dissolved in 100 parts of alcohol. If chloroform is used instead of alcohol, more soluble matter is extracted, and with the addition of 5 parts of oil of lavender it withstands acid better, and the solution is more sensitive. In order to judge better of development, 2 parts of a saturated alcoholic solution of methyl-violet should be added. The image thus obtained is quite as resistant as asphalt, if not developed. The development is effected with alcohol. Although this process can be used for zinc etching, it presents no advantages over the albumen or fish-glue processes. For photogravure it possesses the following advantages: It does away entirely with the costly carbon paper and its concomitant disadvantages of slow drying after sensitising and slow development, the formation of blisters, and the difficulty of seeing the image in the etching bath. It must not be assumed that there is any difficulty in coating the turmeric solution, or that the asphalt will dissolve. The asphalt grain is rendered insoluble by the heating and by exposure to light. For photo-lithography, ordinary litho paper is coated with the above-mentioned turmeric and lavender solution, dried and exposed. Then the paper is squeegeed to a zinc plate moistened with spirit, or to a stone moistened with water; these are then warmed from below till the resin has melted, and then the paper removed by damping, and the zinc or stone moderately etched. For zinc, the etching solution is composed of

Water	1000 parts.
Gum solution (1 : 5)	100 ,,
Nitric acid	15 ,,

for a stone, of

Water	100 parts.
Gum solution	40 ,,
Acetic acid	10 ,,

The stone, when long runs are required, is inked up, and again etched. The advantages of this process are that it does away with the inking up of the print, the wearisome washing of the print, the delicate development of the print, and the difficult transfer. For three-colour printing the following may be used as a filter for the blue negative:—

Chloroform	100 parts.
Turmeric	15 ,,
Dragon's blood	1 part.

The solution is allowed to stand for twenty-four hours, and then filtered. This process may be also used for printing from the negatives in the ordinary way, and by substituting other light-sensitive resins, such as asphalt, guaiacum, dragon's blood, and so on, various shades may be obtained.

Black Varnish.—Herr Fleck strongly recommends the following as possessing several advantages over the ordinary formula:—

Sandarac	10 parts.
Absolute alcohol	100 ,,
Nigrosin (five per cent. alcohol solution)	10 ,,

Chlorides in the Developer.—According to L. Tranchant the soluble bromides, which have hitherto been so much used for restrainers, can be replaced with advantage by some chlorides and organic acids or their salts, because the bromides dissolve the silver bromide and thus give rise to defective negatives, as the most delicate details may be attacked. He states that the

chloride of sodium, potassium, ammonium, and zinc restrain without dissolving the silver salt, as do also sodium acetate, acetic and malic acids; cupric chloride acts as a slight solvent. Arrayed in the order of their restraining powers, the salts are cupric, zinc, sodium, and ammonium chlorides, acetic and malic acids. A 1 per cent. solution of cupric chloride, a 5 per cent. solution of zinc chloride, as well as 25 per cent. solution of sodium and ammonium chlorides, are equal in power to a 20 per cent. solution of potassium bromide, 10 per cent. solution of acetic and malic acid, on the other hand, only equal 1 per cent. of potassium bromide. To use zinc chloride, sufficient sodium carbonate must be added to cause a distinct precipitate of zinc carbonate, and he finally concludes his note by recommending ordinary salt or ammonium chloride. It is obvious that these statements apply only to gelatino-bromide plates, as chloride of silver is readily soluble in most chlorides, even to as high a percentage as ·58 in calcium chloride, as pointed out by Hahn.

Cyanine as a Colour Sensitiser.—Schumann, who is so well known for his researches upon spectrum photography, points out in Liesegang's *Photographischer Almanac* that most of the difficulties met with in using cyanine as a colour sensitiser are due to the employment of plates of too high an initial sensitiveness, and to keeping the plates too long. He states that a plate sensitised with cyanine must be used at once, and that, even after a day, it does not give such clean negatives as when used immediately it is dry. The developer should be of moderate strength, and with plenty of bromide.

Dead Black Varnish.—The following formula is suggested as giving an absolutely dead, lustreless surface:—

Water	500 parts.
Borax..	15 ,,
Shellac	30 ,,
Glycerine	15 ,,

Dissolve and add—

Aniline black	60 parts.

and apply with a brush.

Destruction of the Latent Image.—In continuation of his experiments on Lippmann's process of heliochromy, Dr. Neuhauss finds that, if the exposed plate is left for three days in contact with the mercury, the latent image is destroyed, and that, if the plate had stood in contact with the mercury for an hour and was then kept in the dark for four days, no image could be developed.

Development of Chloride Prints.—Ed. Liesegang, expresses the opinion that the development of printing-out papers will be more generally adopted, and may supplant other processes. Such prints are also superior to those produced on the usual papers for development only. The developer should not be alkaline, or at most only slightly so, otherwise fog ensues. Wilson's method he rejects as being difficult to work. Ferrous oxalate and amidol also are quite unsuitable, as they produce a general blackening of the image. Hydroquinone and gallic acid are practically the only two useful developers. Others, like pyrogallol, brenzcatechin, and para-a-amidol-phenol, produce unpleasant tones. Hydroquinone, with acetate of soda and citric acid, yields prints that, after fixing, have the appearance of ordinary prints, viz., a warm reddish-yellow. Gallic acid, with addition of acetate of soda, also produces warm tones if printing is somewhat full and development stopped at an early stage; but the tones are not as pure as with hydroquinone. With short ex-

posures the tone assumes a greenish colour. The methods of development may be divided into two classes: the first, in which a colour is given to the picture that does not require modification by toning with gold. This can be done with gallic acid, and red-brown, olive, or greenish-black prints may be obtained. The second method requires after-toning in a combined bath. A little reflection will show that hydroquinone is the most suitable for this, because the toning depends upon the presence of a red silver deposit, which is modified by the blueness of the gold. The photographic tone is due to the red of the silver showing through the thin blue deposit of gold. Black bromide prints will receive a deposit of gold, but are not toned because the colour cannot be modified by the gold deposited. Some time ago the writer recommended tannin as a developer. It yields a red tone, but is valueless in practice. The colour is not as pnre as with hydroquinone; the back of the print is liable to discolouration, and it spoils the combined bath.

Effects of Colour on Vegetable Growth.—During last year M. Flammarion made some interesting experiments as to the effect of lights of different colours upon vegetable growth (*Bull. Soc. Ast. France*, June). On July 4, eight identical sensitive plants, which had been sown at the same time, were selected for experiment. These were placed two by two in similarly constructed glass boxes, of which the sides were of different colours, one being red, one green, one blue, and another of ordinary clear glass. All were exposed to precisely the same meteorological conditions throughout. The rates of growth were as follows:—

	Red.	Green.	Blue.	White.
	m.	m.	m.	m.
September 6	0·220	0·090	0·027	0·045
,, 27	0·345	0·150	0·027	0·080
October 22	0·420	0·152	0·027	0·100

Thus, while the plants exposed to blue light made no progress whatever, those exposed to red increased their height fifteen times. The latter, moreover, acquired an extraordinary degree of sensitiveness. Similar results, but not so strongly marked, were obtained with geraniums and other plants. The fact that the plants exposed to white light grew less rapidly than those which were under red glass, although receiving the same amount of red radiations, seems so suggest that the presence of blue light in the former case not only did not accelerate the growth of the plants, but actually retarded it.

Eikonogen and Para-amidophenol.—Dr. Andresen gives the following as the best formulæ for these developers, both for plates and papers:—

Sodium sulphite	2¾	ounces.
Potassium carbonate	1	ounce.
Eikonogen	288	grains.
Boiling water	20	ounces.

The solution should be placed in bottles whilst still hot and immediately corked. It will keep for any length of time, and, if it acts too energetically, should be diluted with a corresponding quantity of water. If very delicate negatives are required, the above quantity of potash should be reduced by one-half. If over-exposure is feared, development should be begun with very dilute developer to which some potassium bromide has been added. For bromide paper the developer should be diluted with five parts of water. A two-solution developer can be made as follows:—

1. Sodium sulphite	1¼	ounces.
Water	20	,,
Dissolve and add eikonogen	150	grains.

2. Sodium carbonate	3	ounces.
Water	20	,,

For use mix 3 parts of No. 1 with 1 part of No. 2.

For para-amidophenol he suggests for a two-solution developer :

1. Para amidophenol	192	grains.
Water	20	ounces.
2. Sodium sulphite	576	grains.
Potassium carbonate	576	,,
Water	20	ounces.

For use, mix 1 part of No. 1 with 2 parts of No. 2.

For a one-solution developer dissolve 5 ounces of potassium metabisulphite in 20 ounces of water and add 800 grains, and add saturated solution of caustic potash till the precipitate first formed is redissolved. This will keep for a long time, and for use should be diluted with from 10 to 30 parts of water.

Elimination of Hypo.—Ommeganck suggests, as a hypo eliminator, a two per cent. solution of borax, which has no chemical action, but merely displaces the hypo. In the discussion upon Mr. Haddon's paper at the Convention, a somewhat similar method was suggested by one of the speakers, and considerable doubt as to the efficacy of the treatment or the correctness of the reasoning was expressed both by Mr. Bothamley and Mr. Haddon, and probably the latter has proved that water is the best hypo eliminator after all.

Ferric Sulphate as a Restrainer.—Le Roy, in the *Bulletin de la Société Francaise*, suggests the use of ferric sulphate as a restrainer in the ferrous-oxalate developer, and states that it is better than using an old developer, as its action is more certain. About ten or twenty drops of a ten per cent. solution should be added to each ounce of the developer. Ferric sulphate, or persulphate of iron, as it is usually called, is quoted at 2*s*. 6*d*. per pound.

Frilling of Celluloid Films. — A valued correspondent, Mr. George Bankart, sends us the description of a method he has adopted for the prevention of frilling in celluloid films, elicited by the complaint on the same subject made to us by Colonel Gubbins in the JOURNAL of June 12. Film-users generally, who find themselves working with films that are prone to frill, will probably welcome Mr. Bankart's remedy, which, he informs us, he adopted with collodion dry plates twenty-five years ago. (1) Procure a small bottle of varnish made of amber dissolved in chloroform. (2) Get a small camel's-hair pencil, and tie it to a thin stick of cedar or wood like the handle of a painter's tool (artist's brush). The stick acts as a 'guide' to the brush when applied to the edge of the plate or film. (3) Dip the tool into the chloroform varnish, and run it quickly round the edge of the film on the emulsion side. It will leave a film of varnish, which dries very quickly and is impervious to water. Care must be used not to use too much, or it will overlap the rebate edges of the plate (or film), and will prevent the action of the developer ; but, if neatly done, it will be a perfect cure for frilling, and is easily and quickly applied. It will dry (enough to handle) in one minute. If it is desired to take it off the negatives *after* they are completed and washed, a little clean chloroform will do it. Guard against splashes or spurts of varnish on the film, as, if any spots settle on it, the development will be prevented. If the emulsion has been slightly separated from the support (in cutting up), the varnish will run in underneath it and cement it to the support.

Glazing Shadows.—Count Vittorio Turati, of Milan, recommends glazing as an important means of improving the shadows and deep tones in process prints, platinotypes, bromide prints, &c. The process is a simple one, and gives excellent results in the hands of the man of taste, but even the ordinary worker, who must study cheapness and rapidity, will find it worth attention. The print is coated with bichromated gum, or other medium, again exposed in the printing frame under the negative, and afterwards washed in tepid water. The shadows retain the gum rendered insoluble by exposure to light, and their depth and transparency are considerably enhanced. Accurate register is not of much importance for the second printing. As a further means of increasing the effect, a slight addition of colouring matter, of either cold or warm tone, according to subject, may be made to the gum solution. Similar processes are used in chromotype, chromo-lithography, &c., where the shadows are treated with varnish. Recent American process prints also exhibit a glazing of this sort, and thereby gain considerably in character and attractiveness. Count Turati thinks both glazed and matt surfaces are open to objection individually, but combined they should carry all before them.

Granularity in Carbon Printing.—Besides the usual method of coating with collodion for avoidance of this trouble, Raimund Rapp, in *Die Photographie*, recommends the use of gelatine and chrome alum. A five per cent. gelatine solution is prepared by first soaking in cold water for an hour and then raising the temperature to 35° or 40° C. Into this is dropped, with constant vigorous stirring, sufficient of a six per cent. chrome alum solution until it thickens. For half a litre of gelatine solution about thirteen to sixteen cubic centimetres of the chrome alum solution are necessary. Now add, drop by drop, sufficient glacial acetic acid until the whole is again brought into a fluid state, and then filter. Before the cleaned glass plates are coated with the solution, they should be given a narrow edging. When this is dry, the plates are levelled and coated in a room free from dust. If the fault arises from too rapid drying of the tissue, it may be obviated by placing a few saucers of water in the drying room. In warm weather it is advisable to cool the water in which the prints are soaked with ice; also be careful to keep the tissue below the surface of the water.

Halation.—If one takes a photograph of an object, says R. Rousseau, in which the contrast between light and shade is very marked, the negative shows, if certain precautions have not been taken, a nebulous luminosity round the light, which makes the picture at this place indistinct. It has been believed until now, that this phenomenon was caused by reflections from the back part of the glass plate; the author, however, is of a different opinion. If the hypothesis mentioned above is correct, some parts of the picture showing halation should be double; but this is not the case. Also, he believes that the strongly dispersive power of the emulsion layer would prevent the reflection of the transmitted light from the second surface. The light, after leaving the emulsion layer, is quite equal, and would, on getting to the back part of the plate, cause, at the most, a general fog; but that does not happen. Founded on accurate research, the author gives it as his opinion that the phenomenon of halation is caused by interference. It seems to be produced by light reflections in the inner part of the camera, *i.e.*, from the blackened inner surface of the objective mounting. It may be avoided if the objective is protected against injurious light, or if the inclination of the apparatus is altered a little.

Images Due to the Oxidation of the Developer.—Liesegang, continuing his researches relative to images due to the oxidation of the developer, remarks that amidol, under certain conditions, will yield such results. A negative developed with pyro and ammonia still retains a printable image

after the silver has been removed with bromide of copper and hypo. If amidol be mixed with an alkali, exposure to the atmosphere or to the air contained in water will yield an intense blue product due to oxidation. Make a developer with amidol and bicarbonate of soda. In use it will take on an increasing violet colour. The negative is stained, but after fixation the deep shadows are clear, and the stain is in proportion to the deposit of silver. Treatment with bromide of copper and hypo discloses the fact of a red to red-brown image, without much reduction by removal of the silver. It would therefore seem that under such conditions the negative owes its intensity principally to stain. The wet negative shows little relief, consequently the stain does not possess much tanning property. Pyro-ammonia and alkaline amidol developers are therefore to be recommended for plucky negatives, full of detail, and for positives of a warm tone.

Improving Process Negatives.—Dr. Eder gives the following chemical method for modification of the size of the dots, which has been used with great success in the Vienna Technical School. For such a purpose the image of the screen may be more pronounced than usual in the negative. Smaller stops may be used, and pre-exposure can be utilised with much effect by means of a sheet of white paper, say for twenty minutes, at *f*-50 to *f*-60 with a square stop. The exposure is then made for the original, with a round stop, at *f*-15 to *f*-16, and should be in proportion to the pre-exposure, which in this case would be six to ten minutes. Develop with a four per cent. iron and sulphate of copper developer. Before fixing, the negative is intensified with hydroquinone and silver. Fix with cyanide of potassium, wash, and whilst still wet intensify by dipping in a solution of—

Sulphate of copper	120 parts,
Bromide of potassium	4 ,,
Water	1000 ,,

followed by quick, plentiful washing in water, and a bath of 1 part of nitrate of silver to 10 or 20 parts of water and a few drops of nitric acid. The negative is now reduced in cyanide of potassium solution, to which has been added a solution of iodine and iodide of potassium. This is carried so far that the dots in the shadows are fine and sharp, but still black on a transparent ground. After another washing, intensification with silver and copper, as before, is repeated, and the negative is again thoroughly washed, and then intensified with lead. The bath consistts of—

Ferridcyanide of potash	6 parts,
Nitrate of lead	4 ,,
Water	100 ,,

Filter, dip the negative in the same, whilst still wet, till a yellowish white colour is attained. Wash thoroughly in running water, until the negative is whitish, then flow over it a solution of one part of acetic acid to one part of water, wash thoroughly and blacken with ammonium sulphide. The reintensification with copper may be omitted if the negative is clear and plucky after development. Dr. Eder recommends this method of correcting process negatives as practical and safe.

Iron-Printing.—Ardut & Troost, of Franckfort, have found that, if a sheet of paper free from chlorides be floated on a mixture of—

Ammonio-citrate of iron	96 grains.
Silver nitrate	20 ,,
Tartaric acid	20 ,,
Gelatine	15 ,,
Water	2 ounces,

and then dried, it gives a printing paper which is five times as sensitive as ferro-prussiate, and that it will keep for several months, and gives, on washing with water after exposure, a dark-brown image.

Lactate of Silver Plates.—Guilleminot of Paris has introduced lantern plates prepared with silver lactate, which with a metol carbonate developer are said to give excellent results as regards vigour, clearness, and tones. The light-sensitiveness of silver lactate was discovered by Pelouze and Guy-Lussac in 1833, and it was used by Cooper in collodion emulsion (THE BRITISH JOURNAL OF PHOTOGRAPHY, 1871, p. 587). In printing out, its sensitiveness is stated by Marktanner-Turneretscher to be eighteen as compared with 100 for silver chloride.

Modern Printing Processes.—Jul. Raphaels writes concerning modern printing processes. If our prints are to appear 'unphotographic,' we must give as much attention to their production as to making the negative. Photogravure he pronounces unrivalled in this respect, but how few amateurs or professionals can work the process! After comparative experiments with platinum, bromide, and many sorts of printing-out paptes, he gives the preference to matt-surface chloride, slightly printed and developed. Weak negatives give less satisfactory results than good negatives full of contrast. The developer to be used is important. Hydroquinone produces a reddish image, easily toned, and too like an ordinary print. Gallic acid is much better, producing olive-green to green-black tints, that do not require toning. The exposure should be a quarter to one-sixth of that given for a fully printed image. The developer :—

Water	100 c. c.
Concentrated alcoholic solution of gallic acid...............	5 ,,
Fifty per cent. solution of acetate of soda	10 ,,
Alcohol..	25 ,,

The print should be rather over-developed, then washed and fixed. To modify the tone, after development, the combined bath may be used.

Neutral Developers.—Professor R. Namias has been experimenting with neutral developers made with magnesia and sulphite, and finds that, though slow, they act well. The equations representing the chemical reactions he states to be as follows: The hydrobromic acid set free by the reduction of the silver bromide sets free sulphurous acid from the sulphite—

$$2HB_2 + Na_2SO_3 = 2NaBr + H_2SO_3,$$

and the developing action is lessened. If now magnesia MgO is added, the sulphite is neutralised with the formation of magnesium sulphite.

$$MgO + H_2SO_3 = MgSO_3 + H_2O.$$

In this manner the developer remains neutral the whole of the time. If developers are used in which the acid of the radical is not completely saturated, the magnesia will neutralise this and the developer be more energetic. Magnesia developers have less tendency to oxidise, and no ill effect is produced on the gelatine. Pyro, eikonogen, and metol are suitable for this kind of development, but hydroquinone loses all its developing power. Such developers are best prepared by using double the normal quantity of developing agent with the corresponding quantity of sulphite, and adding about fifteen parts of magnesia to every 1000 parts of solution. After use it can be poured into a bottle for repeated employment.

Pegamoid.—Under this name there is now being introduced into commerce a new substance which seems to combine in itself the respective virtues of

leather, celluloid, waterproof varnish, and close-grained wood. It is claimed that artificial leather made by its aid is superior to even real morocco, while American cloth and cheap leathers are entirely put out of court by the new substance, which is both waterproof and uncrackable; it will not chip off, nor spontaneously ignite, which are two qualities often characteristic of the materials named. It will do for covers of books and trunks, and may be used for maps and enamelled paper, and is very suitable for wall and ceiling papers, which can be easily washed and cleaned. For this reason, if all that is claimed for it turns out to be realised, it should be of the highest value in photography. Dark-room papers and fittings, not to speak of cameras, hand or otherwise, should offer a very suitable field for its employment. We await, with considerable interest, some further account of its behaviour in actual use.

Phosphorescence of Gelatine Plates.—If a gelatino-chloride or bromide plate is developed by the ordinary pyro-soda developer, and after being slightly washed is placed in a two per cent. solution of citric acid, it gives a bright phosphorescent light. The same effect is produced if a plate that has been developed, fixed, and dried, is soaked in the pyro-soda developer before being dipped into the citric acid. This result does not depend on the presence of the silver of the image, as plates only coated with gelatine show the same phenomenon; the light is not produced if, instead of using pyro-soda solution, only the alkali is used, or only the pyro with or without sodium sulphite. The phosphorescence is best shown by placing the plate in a ten per cent. soda solution, and allowing it to soak for about ten minutes, then adding a little pyro solution which has been allowed to go brown; on the other hand, it does not appear if the pyro solution is completely oxidised. It a freshly, prepared colourless solution of pyro soda is used, and the plates allowed to remain in only a short time, the light emitted is very weak; it is much stronger if the citric-acid bath has been used a few times. The author suggests that this remarkable phenomenon may perhaps explain the mysterious cases of fog which occur with gelatine plates.

Phosphorescence of Gelatine Plates.—The phenomenon, says F. Pricht, observed by several experimentalists of gelatine plates, soaked in a pyrogallic acid developer, becoming luminous when placed in a dilute solution of citric acid, is caused by a process of oxidation which gives rise to a luminosity identical with that produced during the slow oxidation of phosphorus, and renders it probable that all processes of rapid oxidation are accompanied by evolution of light, even when the oxidation takes place in aqueous solution, though a certain intensity of oxidation is required to give rise to it. Other developers than pyrogallol, even when possessing a nearly similar constitution and properties, such as hydroquinone, do not give rise to luminosity. The cause of the luminosity is explained by the author in the following way:—1. The alkaline pyrogallol solution gives, on addition of acids, oxygen which oxidises the sodium sulphite in the developer to sodium sulphate, with evolution of light. 2. The pyrogallol solution, when mixed with caustic soda and sodium sulphite, absorbs oxygen from the air, and this oxidation is also accompanied by evolution of light. The correctness of this explanation is rendered probable by the fact that easily reducible bodies, such as permanganate of potash, give out light on addition of alkaline pyrogallol solution. When sodium sulphite combines with oxygen in the presence of pyrogallol, no luminosity is produced even if the pyrogallol has been previously slightly oxidised; but, when alkaline pyrogallol solution, which has been partly oxidised, is decomposed by the addition of acid, the author considers it probable that some of the oxidation products of pyrogallol are decomposed with evolution of oxygen, which combines with the sodium sulphite, forming sulphate, and thus giving rise to luminosity.

Phosphorescence in Development.—A. Helheim draws attention to this subject in the *Photographisches Archiv.* After reciting the experiments of Dr. Neuhauss in 1892, Dr. Precht in 1895, and those of Lenard and Wolf in 1888, he writes that he has had similar experience in studying the action of formaldehyde as a constituent of the developer. He made up a developer of—

Water	30 grammes.
Pyrogallic acid	1 gramme.
Carbonate of soda	$1\frac{1}{2}$ grammes.
Formaldehyde (40 per cent.)	2 ,,

The negative was over-exposed and fogged. After laying aside a few minutes, the plate was seen to glimmer, first at the edges and then towards the centre. The light was bluish-white, and observable even in presence of the dark-room lamp. The phosphorescence appeared as soon as all moisture was absorbed from the surface, and lasted several miuutes. Thinking the absorption an important factor, as the phosphorescence was imperceptible whilst the plate was in the dish, the writer tried the effect of another absorber of water, and added 30 c. c. of alcohol to the developer. A very intense phosphorescence was at once visible. As it passed away, it could be revived by shaking the bottle. The addition of alcohol, of course, precipitated the carbonate of soda, and produced similar conditions to those in the experiments of Lenard and Wolff, who poured pyrogallic acid developer into an equal quantity of saturated solution of alum.

Photographic Perspective. — Professor Schiffner points out that the smallest angle under which an object is visible is generally assumed to be one inch; when viewed at the distance of normal vision, about ten inches. According to Mertens, the angle at which an object is distinctly seen is about 27°. The angle of the eye to see an object clearly is 45°, the mean is 36°, and a picture is generally viewed at a distance equal to one and a half to twice the longer base of the picture, so that the generally accepted focus of a lens as one and a half times the longer base of the plate is correct. With these data, b, it is possible to reckon out, with any given object, distance g, the focus f, of any lens which will answer to these requirements, by the formula $f=\frac{gb}{g+f}$; or, for a lens of known focus, the correct distance of object $g=\frac{bf}{b-f}$. He also points out the importance of the correct position of the point of sight, which should be below the horizontal middle line, as it is far easier to look up than down. Objects which should appear natural should appear for the greater part above the horizontal line of sight. The horizon should be about one-third below the middle line of the picture.

Pyrocatechin.—Liesegang draws attention to this substance as a developer for chloride prints. Owing to the lower price at which it is now procurable, it may attain some importance as a developer for dry plates. Prepare the following solutions :—

A.

Water	250 grammes.
Acetate of soda	50 ,,

B.

Alcohol	200 grammes.
Pyrocatechin	10 ,,

For use equal quantities of both solutions are taken and diluted with water, according to exposure or strength of contrast required. For soft prints ten parts each of A and B, with fifty parts of water, are recommended, but for

great contrast increase A and B to twenty-five parts each. With the same developer less exposure will give weaker prints. Develop rather stronger than required for the final result, and tone in the usual combined bath. This will give prints of the ordinary photographic brown tone. Fixing without toning gives unpleasant tones and reduces the print too much.

Relative Permanence of Prints.—Vogel classifies the various printing methods, according to their permanency, as follows:—(1) Prints on gelatino and collodio-chloride paper, toned in a combined bath, fade very quickly; (2) the same papers and albumenised, treated with separate baths, keep better; (3) developed silver prints are still more permanent; and (4) the carbon process gives prints which are chemically unalterable; whilst (5) the most durable prints of all are given by the platinotype process.

Skin Complaint Caused by Hypo.—Mr. W. Brown, 9, Gilmour-street, Paisley, writes with reference to a skin complaint being caused by hypo: I may say that I have suffered from the same for some years, and blame the pyro and ammonia as the original cause, although hypo will irritate the complaint; indeed, long working in cold water will revive it after once started. To prevent it in the first instance, I think it advisable to lift plates from the solutions with a thin flat crochet pin; I have tried many remedies, but the following is the only one which has been effectual with me, and for which I am indebted to a photographic chemist. Before using, wash the hands with Castile soap or coal-tar soap. Liniment of iodine, say half ounce, one or two applications with brush or cork will dry up the disease. To relieve the irritation and to prevent a return of the complaint, I use always after developing, and when troublesome, the following wash:—

Carbolic acid	1 drachm.
Wright's coal-tar solution	½ ounce.
Glycerine	3 drachms.
Water up to	12 ounces.

Sodium Tribasic Phosphate.—Dr. Max Kortüm strongly recommends the use of this salt to replace the ordinary alkalies, and suggests the following developer:—

1.	Water	400 parts.
	Sodium sulphite	40 ,,
	Hydroquinone	5 ,,
2.	Water	200 ,,
	Sodium tribasic phosphate	32 ,,

Mix in equal parts. He further states that the action of the salt is due to the absorption of carbonic acid from the air and its consequent dissociation into sodium carbonate and phosphate.

Soldering Aluminium.—For such work as joining the edges of the metal in making tubes for optical work, the difficulties of soldering aluminium were long considered a great drawback to its possible future usefulness for these purposes. Improvements have been made, but, from a paper read by Mr. J. Richards before the Franklin Institute, we learn that a method has been discovered by him of reducing the soldering to a very ordinary operation. In his paper he points out how Christoffe, the goldsmith of Paris, showed that the metal could be soldered by either pure tin or pure zinc; but the discovery proved useless, for the zinc junction is brittle, will not stand working, and soon discolours, while the tin seam disintegrated, and fell to pieces in a few weeks. Other inventors recommended the use of ordinary solder, with the use of chloride of silver as a flux, which would naturally be costly, and some one has proposed this as a reason for the enormously high prices of aluminium-mounted photographic objectives. Mr. Richards set himself the task of

discovering a solder possessing the necessary characteristics: 1. It must heat, and adhere closely; 2, must not disintegrate after exposure to air; 3, have a low melting point; 4, be the same colour as aluminium, and not change colour; and finally, 5, must be cheap enough for general use. These requirements he obtained to a reasonable extent after a series of experiments, but it was discovered that, upon remelting this solder, a more fusible portion separated from the mass, and this was found to act still better under the iron than the first-made. The composition of this was proved on analysis to be aluminium, one part each of phosphor-tin and aluminium, eleven of zinc, and twenty-nine of tin, the two latter being present in the proportion given by the formula Sn_4Zn_3. He says, 'The result of the investigation is before you in the specimens of soldering presented for your inspection. As practical usefulness is a fair criterion of the value of an invention, I may be permitted to mention that this solder has come largely into use in Germany, Switzerland, England, and our own country.' If all that is claimed for it be true, the use of this new solder ought to lead to a cheapening of aluminium-mounted lenses, the price of which, notwithstanding the admission of the difficulty in working it in the lathe, tapping it, &c., is still very high.

Solidified Gelatine.—Gelatine possesses the curious property of becoming insoluble in contact with formic aldehyde, and, at the same time, of preserving perfect transparency. Gelatine rendered insoluble, or "petrified," to use a more appropriate term, resists water, acids, and alkalies. It resembles celluloid, but has the great advantage over the latter of not being inflammable. We have here, then, a new product very easy to obtain, possessing interesting properties, and destined to play an important *rôle* in the industries. The gelatine used is the ordinary article found in commerce. The formic aldehyde is what is commonly called "formol," "formaline," and "tannaline." The commercial product is a forty per cent. solution of formic aldehyde in water. It is a colourless, sirupy liquid of a pungent odour. The vapour is not inflammable, and it is a powerful antiseptic. In order to obtain moulds of statuettes, &c., we take, for example, two pounds of good white gelatine, and steep in a quart of water for a night. The next day the whole is melted over a water bath. For delicate mouldings, the solution is diluted with a little water. The mould, which may be made of plaster, clay, or metal, having been prepared, the formic aldehyde is poured into the melted and slightly cooled gelatine. The whole is well stirred with a wooden spatula in order to obtain a homogeneous mixture. The latter is then poured into the mould and allowed to cool. After the object is taken from the mould it is finished by immersing it for a few instants in a concentrated solution of formic aldehyde, or, if it is too large for immersion in the solution, its surface is painted therewith. Unfortunately, objects obtained with the gelatine alone are transparent and resemble glass. By previously adding to the gelatine some finely sifted zinc white mixed with a little water and alcohol, and in operating in the same way, beautiful imitations of white marble may be obtained. By mixing the oxide of zinc with appropriate colours, objects of all shades may be obtained, and, by properly arranging the colours, veins, striæ, spots, &c., may likewise be produced. The solidified gelatine may be used for imitating mother-of-pearl, tortoiseshell, amber, coral, &c., and for the manufacture of toys, and artificial flowers.

Spotting Gelatine Prints. — For spotting highly glazed gelatine prints A. Helheim recommends the use of aniline colours dissolved in alcohol, one part of rose aniline with two to three of ethyl green. The addition of a little blue may at times be necessary. The colour dries almost immediately. It is preferable to use little colour, and, by repeated strokes with the brush, attain the desired tint. The colour may be removed with a clean brush moistened with alcohol, and the surface does not suffer.

Starch Mountants.—E. Valenta says:—If starch is treated with aqueous alkali under certain conditions, it swells and forms a semi-transparent, viscid mass, having strong adhesive properties. This product is variously known in commerce as vegetable glue, glutine, triticine, collodin, &c. Most of all these preparations show a strong alkaline reaction, and upon this account are useless for photographic purposes, notwithstanding their great relative adhesive properties.

In cases where the product is neutralised with acid, it proved at the expense of the adhesive properties. Consequently, on account of this effect, all advantages of these vegetable glues over ordinary starch paste are lost when the former is in a neutral condition.

Far superior, for photographic purposes are mountants composed of starch in combination with the gum arabic or dextrine. These mountants have the advantage over all gelatine mountants that they are viscid or pulpy at an ordinary temperature, and at the same time possess a relatively strong adhesiveness.

An excellent mountant of this nature is made as follows, and which answers for mounting ordinary photographs, such as albumen, Aristo, platinotype, and celloidin prints, as well as glacé or matt Aristo prints, in all their variety, as it has the advantage of not penetrating through the paper.

White gum arabic	35 grammes.
Water	100 c. c.

After the gum is dissolved strain through a piece of muslin to remove any possible foreign substance, then add

Starch	30 grammes.

Stir this in a mortar or suitable dish, and heat the whole mass over a water bath until the paste has reached the required consistency.

The addition of a little white sugar has proven of advantage.

The substitution of dextrine for gum arabic somewhat lessens the adhesive properties of the mixture.

Compounds of dextrine, alum, sugar, water, and carbolic acid (as an antiseptic) have also proven of service and value in these experimental tests.

A good formula is as follows:—

Dextrine	60–90 parts.
Alum	4 ,,
Sugar	15 ,,
Water	120 ,,
Carbolic acid, 10 per cent.	6 ,,

Mixtures of Starch Paste and Dextrine

in various forms have of late been brought into commerce and sold for photographic purposes. One of the most widely advertised pastes of this class is one labelled "Concentrated White Paste." This paste represents a viscid white mass, which, according to careful analysation, consists of water, starch paste, dextrine, boracic acid, glycerine, and a small portion of thymol as an antiseptic.

Gelatine or Glue Mountants

are absolutely unfit for mounting photographs. As the gelatinous mass has to be liquefied by heat for use, it readily decomposes, and, if diluted to a proper consistency, has the fault of penetrating through the paper.

The simplest method to overcome the latter drawback, and at the same prevent rapid decomposition, consists in adding to the liquid glue a small quantity of amyl-alcohol (fusel oil).

Liesegang recommends as mountant for his glacé Aristo prints a paste made from good glue (Cologne glue, free from acid) to be first swelled in water, the

surplus water to be poured off, to which is to be added, under constant stirring, one c. c. of amyl-alcohol for every thirty c. c. of the dissolved glue. This mountant can be diluted with water. It sticks well, but must be used warm. The disadvantage in its use is the strong smell of fusel oil that it imparts to the print.

COMPOUNDS OF GLUE AND STARCH PASTE,

to which a greater or less quantity of turpentine is added, possess strong adhesive properties, and have frequently been recommended for photographic purposes.

An excellent mountant of this class can be made as follows: 40 grammes of good (Cologne) glue is soaked in 100 c. c. water and melted over a water bath. When from 80 to 100 C., 40 to 50 c. c. of dissolved starch is added, the mixture being constantly stirred. When these have united and formed a homogeneous glutinous mass, 10 c. c. of turpentine is added gradually until the whole mass forms a thick, brownish, sticky liquid.

This mountant, unfortunately, must also be applied warm. The addition of the turpentine, as proven by many experiments, in no manner affects Aristo prints.

Good results, with extraordinary adhesiveness, were obtained according to the process patented in Germany, by E. Wiese, of Hamburg. This consists in a liquefaction of gelatine or glue by means of chloral hydrate (D. R. P., No. 77, 103).

When gelatine or Cologne glue (a bright-coloured, very adhesive glue) is steeped in water and then melted, and a certain quantity of chloral hydrate added, an adhesive paste results of great strength, which has the property of remaining liquid, and, as proven by experience, is well calculated for photographic purposes.

A good formula for preparing a mountant of this class is as follows:—

Gelatine or Cologne glue	40 grammes.
Water	120 c. c.

The glue is to be steeped in the water, and then dissolved over a water bath.

Chloral hydrate	20 grammes

is then added, and the whole mass heated for some time. This results in a clear, sticky fluid, which can be neutralised with a few drops of a soda solution.

This mountant has the advantage that, with its great adhesiveness, it does not go through the paper.

Above mountants, continues Herr. Valenta, are only to be recommended in cases where starch paste fails to fill the requirements; for instance, with Aristos having a glacé or matt surface, &c.

As all the above recipes have been carefully tested in actual practice, they may be relied upon with hesitation in all cases where their use is desirable or necessary.

Stripping Gelatino-bromide Plates for Use as Film Negatives. — E. Valenta says: 'A method of preparing film negatives from ordinary dry plates has been worked out by M. H. Reeb, of Paris.

'As means to this end he sends out two colourless fluids: "liqueur infaillible," and a collodion "collodion infaillible," contained in yellow bottles of 90 grammes and 300 grammes.

'M. H. Reeb's process, for preparation of a film negative from an ordinary dry plate, is very simple and gives good results. We have had the opportunity of using it frequently.

'The procedure is as follows, according to the instructions sent out with the preparations:—

'1. Soak the gelatine negative in the "liqueur infaillible." The object of this operation is to destroy the adhesion of the gelatine to the glass.

'One part of the "liqueur" is diluted with nine parts of water; in this the negative is soaked five to ten minutes, then drained and dried. It matters not if the negative is wet or dry, intensified or not intensified, retouched or untouched, provided that the retouching is insoluble in water.

'2. Coating the film with "collodion infaillible."

'The negative, after having been treated as above with the "liqueur infaillible," and dried, is placed on a levelling stand in a horizontal position and coated with the "collodion infaillible." For this purpose seven cubic centimetres are used to cover 100 square centimetres (about sixteen square inches).

'The collodion is allowed to set perfectly when it turns a dull milky colour, which passes over to a uniform blue. When it has reached this stage, the negative is well washed and the film is cut through round the margins, with the edge (not point) of a sharp knife. The cut should be made at one or two millimetres from the margin. After drying the film with filter paper, pressed down with an indiarubber roller, which will remove all superfluous moisture, the stripping can be performed with ease. The film is then transferred to the following glycerine bath :—

Glycerine	50 cubic centimetres.
Alcohol	50 ,, ,,
Water	1000 ,, ,,

'3 Drying the films.

'The film is dried on the glass from which it has been stripped, but with the collodionised side next the glass. For this purpose, the glass is cleaned by sponging with a little of the diluted glycerine bath, the film is then laid down upon it, whilst still dripping wet from the glycerine bath, a sheet of filter paper is then pressed upon the film with a a rubber roller in both directions, and the plate is stood up to dry spontaneously. The film then loses its milky appearance.

'The dried film, whilst still on the glass, is again coated with thinned "collodion infaillible" (one part collodion to two parts ether and alcohol) and drained.

'If oily drops appear on the surface, they may be removed with a wad of dry linen or a little diluted alcohol. The dried negative is again cut through at the margins, stripped from the glass, and preserved flat between sheets of paper. If there is any difficulty in stripping, the plate is placed in warm water (40° C.), when it will come off directly. Dry between two drying boards under slight pressure in a copying frame.

'The process we have just described is very good and practical, and would, doubtless, be very welcome to all if the price of the materials, which Mr. M. H. Reeb has placed upon the market was not so considerable. A small bottle containing 90 cubic centimetres of "liqueur infaillible" costs 2 frs. 50 c. A bottle containing 300 c. c. of "collodion infaillible" costs 4 frs. 50 c., according to the labels. For the worker these prices are too high. We have, nevertheless, introduced the process at the Imperial Technical Institute, and we have succeeded in making up both preparations, and we now find it very inexpensive.

'As the matter interested me from the photo-mechanical as well as the chemical point of view, I investigated the composition of both solutions, the "liqueur" and the "collodion infaillible," with very satisfactory results.

'The investigation showed that both the solutions in question were of rather simple composition. The "liqueur infaillible" is a solution of formaldehyde, similar to that sold by Schering, of Berlin, under the name of formalin, whilst the "collodion infaillible' is an oily collodion, such as we meet with in commerce under the name of enamel collodion (plain collodion with two per cent, of castor oil). The experiments instituted with formalin and enamel

collodion gave very good results, and, based upon them, I can give the following cheap and simple directions for the stripping of gelatine plates :—

Formalin	10 c. c.
Water	150 to 200 c. c.

'The negative is left in this solution for ten minutes, then dried and coated with a two per cent. enamel collodion, or solution of gelatine.

'In the first case, the treatment should be as already described for the "liqueur" and "collodion infaillible ;" in the latter, the dry plate is treated as though it were a stripping plate, or a collodion emulsion plate. The plate is placed on a levelling stand, brought accurately to the horizontal, and coated with the following gelatine solution, in a slightly warm condition, to a depth of 2 mm. :—

Gelatine	75 grammes.
Water	500 ,,
Glycerine	10 ,,

'Filter through flannel.

'After the plates are set, they are set up to dry, and then coated with a much diluted negative varnish, or plain collodion, to protect them from damp.

'When they are again dry, the film is cut through with a sharp knife and stripped from the glass.

'The action of the formalin is that of an exceptionally good indurator ; the film of the dry plate is hardened through and through, and does not adhere so firmly to the glass. It can consequently be stripped easily by means of the collodion or gelatine coating, which adds to the strength of the film. The process is uniformly successful, and gives very good results. For this reason, and because the cost of the chemicals places it within easy reach, I can especially recommend it to practical men.

Stripping Negatives.—Here are two methods for stripping negatives from glass. The first by Mussat is on the following lines. The plate is first placed in a bath consisting of one part of the commercial formalin and ten parts of water. After soaking for five minutes, it is rinsed with water, and the film is cut through with a knife at about $\frac{1}{10}$ inch from the edge. The plate is then placed in a water bath and the temperature raised to about 120° Fahr. The film separates from the glass, and is transferred to a collodionised plate. It may then receive another coating of collodion, and can easily be separated from the temporary support. The second method, by Roy, recommends the use of a bath consisting of 100 parts water, 50 parts formalin, and 5 parts glycerine. The film is cut through at the edges and allowed to dry. To strip the film from the plate, place the negative for three minutes in a bath of 100 c. c. water, and 20 grammes carbonate of soda. Without washing, immerse it in a five per cent. solution of hydrochloric acid. The carbonic acid generated between the film and the glass will effect the separation. The film is then transferred to collodionised glass, recollodionised, and stripped. In either case the film does not expand.

Substitute for Diamond for Cutting Class.—The time-honoured glazier's diamond seems in danger of being displaced by a cheaper substitute, even more efficient than the original instrument. It is reported that M. Moissan has discovered a means of forming a compound of boron and carbon by heating boracic acid and carbon in an electric furnace, the intense heat of which has already been the means of introducing into every-day use substances that hitherto were either unattainable or too costly. The new substance in appearance is black, something like zoophite ; and its hardness is so great as to enable it to cut diamonds with ease. Unlike the results of previous experiments in artificial-diamond making, which were in minute particles, the new cutting material can be produced in pieces of any size required.

The Use of Urea in Gelatino-bromide Emulsions.—M. Pierre Scheers has described his experiments with urea as an addition to bromide emulsions. He points out that the fineness of grain of the silver bromide is dependent on several factors, such as, the concentrations of the solutions, the quantity of the gelatine, the degree of heat, and the method of precipitation. A fine-grained but slow emulsion usually appears of a deep yellow by transmitted light, and it is desirable to transform this colour into blue or violet, which transformation is usually accompanied by an increase of grain. The transformation or ripening is usually effected by heat, or ammonia, both methods having considerable disadvantages, which do not accompany the use of urea, which is slowly decomposed into ammonia and carbonic acid. A definite quantity of urea—which, by the bye, is not stated by the author—is added to the emulsion, together with the ferment necessary to produce this decomposition. This ferment is obtained from urine allowed to stand and ferment, and, by the addition of alcohol, some substance, assumed to be of the nature of diastose, is precipitated, which can be filtered out and kept in a bottle, and mixed in small quantities with the urea before adding to the emulsion. This, it is said, produces an extremely fine-grained, rapid emulsion.

The Viviscope.—A great deal of ingenuity is devoted to the production of entertainment devices, and many most ingenious ones have been illustrated in our columns, but it is seldom that one more interesting, says the *Scientific American*, from the scientific as well as amusement standpoint, can be offered to our readers than the one termed the viviscope. Supported on a standard is a circular stage. Concentric with the stage, a circular block, about eight inches in diameter, is rotated by a hand wheel. This block is surrounded by a cylinder secured immovably to the circular stage. Attached to the disc are two wires projecting nearly radially from it, and carrying at their outer ends a block of crescent shape, and which depends directly over the perimeter of the stationary cylinder. As the hand wheel is rotated, this block whirls around and around the cylinder.

With the viviscope are supplied a number of endless bands of paper with coloured pictures of figures in progressive stages of movement, drawn on the zoetrope principle, the same as is followed in securing the photographs for the kinetoscope and vitascope. These bands have their ends pasted together, and are of such length as to fit rather loosely over the stationary cylinder and the depending block. A screen with a hole is provided, which is mounted on the perimeter of the circular stage, and through this aperture the spectator is supposed to see the figures. One of the beauties of the instrument is that the screen is not really necessary, and that without it the movements can be seen by an entire room full of people. When the hand wheel is turned, the block whirls around between the stationary cylinder and the endless band with the figures on it. As the block passes under each figure, by a very peculiar principle of wave motion, the figure is shifted one space forward. Thus, for each rotation of the block, every figure on the band, which, of course, means the whole band, is shifted one space ahead, so that a perfect zoetrope effect is produced, and the figures seem endowed with life.

The easiest way to figure to one's self the mechanical principle evolved is to imagine a rope secured to the floor at one end of a room and reaching clear across it exactly to the door sill opposite the wall, near whose base it is attached. Now let a footstool be placed beneath the rope near the fastened end. It is obvious that the free end will be drawn back, say a foot, from the door sill, and, of course, all the rope in front of the footstool will share the same displacement. Now let the footstool be moved forward toward the door. The rope will pass over it, and, as it is left behind by the footstool, it will regain its original place upon the foot. Each particle of the rope is left one foot in advance of the position it occupied when in front of the footstool. As

the footstool is pushed out of the door, the end rope will leave it and regain its original position with its end at the door still a foot in advance of its position when the footstool was beneath the rope back of it. The difference between the rope illustration and the mechanism of the viviscope is that in the viviscope an endless band takes the place of the rope.

It will be obvious, we think, why this ingenious toy seemed worthy of a far more than passing consideration. It represents a most ingenious mechanical movement, one which may be termed paradoxical, and which really is a good subject for the exercise of ingenuity in reaching a full and satisfactory explanation of its principle. Independent of this feature, it forms an excellent entertainment device, one whose principal charm consists in the fact that the figures are directly seen without the intermediation of any slot. The band is perfectly fixed in position, except such parts of it as the block passes under; the block being but one-seventh of the circumference of the cylinder, the band is stationary six-sevenths of the time. This gives the requirements for a kinetoscope, and the viviscope must, we think, be recognised as such. It is peculiarly timely now when the public has been so much interested by the exhibitions of the kinetoscope and vitascope, which have been witnessed by so many. Considered as a toy, it marks the only radical advance ever made on the construction of the old slotted zoetrope.

Toning Lantern Slides.—Th. J. Placzek, of Vinna, writes in reference to the toning of collodion transparencies. If pyrogallic acid be used, instead of iron, for development, a pleasing blue-black deposit results, that can be easily toned with neutral chloride of gold, chloride of palladium, &c.; but the large addition of glacial acetic acid to the developer makes double the exposure necessary as compared with iron development. In consequence of this, attempts have been made to tone the greyish-black image of iron-developed positives, and the following bath has been found very useful :—

Solution of potassium chloro-platinite (1 : 50)........	4 c. c.
Nitric acid	12 drops.
Solution of chloride of gold (1 : 50)	3 c. c.
Distilled water..	550 to 600 ,,

The plates, after fixation with hyposulphite of soda, or preferably cyanide of potassium, are well washed, and, whilst still wet, placed in the toning bath for one or two minutes. They acquire a blue-violet tone, which is found very suitable for lantern slides or stereoscopic transparencies. Dry-collodion plates may also be toned in this bath, but the process is much slower, owing to the horny character of the collodion film, which resists the penetration of the solution. A bath of potassium chloro-platinite (1 : 1400), slightly acidified with hydrochloric acid, gives a blacker tone. A solution of—

Water	500 parts,
Sulphocyanide of ammonium	20 ,,
Hyposulphite of soda..	½ part,

added in equal quantity to the following :—

Water	500 parts,
Chloride of gold solution (1 : 50)	30 to 40 ,,

gives grey-blue tones. Platinum and gold toning is very successful with these baths.

To Avoid Air Bubbles.—To avoid air bubbles in developing bromide or other papers, Liesegang in the *Archiv*, recommends that they be immersed in the developer film upwards, and that the film be turned downwards before another sheet is placed in the dish. For the development of chloride papers,

without inconvenience from air bubbles, he recommends the addition of alcohol to the developer, for instance :—

Water	200 grammes.
Gallic acid	1 gramme.
Acetate of soda	10 grammes.
Alcohol	50 ,,

To Blacken Steel and Iron.—A mixture of

Mercuric chloride	2 parts,
Cupric chloride	1 part,
Hydrochloric acid	6 parts,
Alcohol	5 ,,
Water	50 ,,

is suggested for blacking steel. The article should be well cleaned and immersed in the above for a few minutes, allowed to dry, and then placed in boiling water for half an hour, and the operation repeated if not black enough.

Tricolour Projection.—M. Marguery suggests the following baths for obtaining the self-coloured images for projection :—

FOR THE RED SENSATION.

Carmine	5 parts.
Ammonia	15 ,,
Water	100 ,,

FOR THE GREEN SENSATION.

Saturated solution of picric acid.

FOR THE BLUE-VIOLET SENSATION.

Methylene blue	10 parts.
Water	100 ,,

Glass coated with plain gelatine should be soaked in a three per cent. solution of bichromate of potash, and then dried and exposed under the negatives, developed with hot water, and then soaked in the above baths.

Waterproofing Dishes.—Although the recent introduction of enamelled steel dishes will, for large work at least, replace, to some extent, porcelain dishes, yet there may be some who wish to construct wooden dishes, and to render these and wooden sinks, &c., watertight. Hugo Müller recommends an indiarubber varnish made by melting two parts of common resin till fumes are given off, then adding one part of finely shredded indiarubber, not vulcanised, and stirring till it has dissolved. The vessel must now be taken from the fire, and two parts of linseed oil added, and stirred till it sets. It requires melting by a gentle heat before use, but will be found very efficient.

Varnishing Films.—Balagny recommends giving cut films a coating of three per cent. amyl-acetate collodion, to which about two per cent. of castor oil has been added. The film should be fastened by pins to a board, and brushed over with the above varnish, a narrow margin being left untouched. When the varnish is dry, the film should be turned over and treated in exactly the same way. He states that films treated in this way will not curl.

Yellowing of Platinotypes.—Ommeganck points out that the yellowing of platinotype prints is most probably due to traces of iron, which, notwithstanding treatment with hydrochloric acid, are very difficult to remove. He states that, if the prints are treated with a solution of ammonium tartrate and then well washed, the whole of the iron can then be removed. The ammonium tartrate solution can be prepared, adding sufficient ammonia to a five per cent. solution of tartaric acid to make it smell fairly strongly.

Yellow Screens.—An important paper, by Dr. Otto Buss, appeared in the *Photographische Correspondenz* upon the action of various yellow dyes upon the spectrum, particularly with regard to the ultra-violet. Picric acid, safranine, Martin's yellow, naphthol yellow S., aurantia, fast yellow, metanil yellow, and auramine, all show more or less absorption of the visible blue and violet end of the spectrum, but yet allow considerable quantities of the ultra-violet to pass, and in most cases the distinctly marked bands of non-absorption lie beyond λ 360. Several vegetable colouring matters were also examined, such as saffron, turmeric, mace, euonymus petals, and also some of the pure crystalline colouring matters, such as xanthophyll, xanthacarotine, and of these the xanthophyll completely absorbed the ultra-violet, and, if it were possible, this would make a good isochromatic screen. Alcoholic extract of the yellow petals of corydalis lutra, primula elatior, calendula, and carthamus, and the yellow colouring matter of the lemon absorb also the whole of the ultra-violet. Dr. Buss points out that most of the existing formulæ for yellow screens are extremely unsatisfactory, and that they, like the commercial glass screens, only absorb the rays from H in the violet to G or F, and, because our eyes are extremely insensitive to these rays, a slight damping of these rays is falsely recognised as total absorption, whilst actinic rays may still pass; and the only way to really test a screen is by photographic examination of a dye in quartz spectroscope, which permits the whole of the ultra-violet to pass. As an example of how some of the screens act, he takes Vogel's formula for making yellow screens, which is a solution of aurantia in collodion 1:250; 20 c. c. of this being allowed for a screen 13×20 c. c., the thickness of the resulting collodion film would be $\frac{20}{13 \times 20} = 0\,0077$ mm. Buss points out that he used a solution 1·5000 in a thickness of 5 mm., which was thirty-two times stronger than Vogel's, and yet this allowed ultra-violet light from λ 370 to λ 300 to pass, and he sarcastically asks, "How much more, then, would the thirty-two times thinner film allow to pass?" It might be assumed that the glass itself of the screen or the lens would absorb the ultra-violet, but Eder and Valenta have pointed out that 1 c. of the most ultra-violet-opaque glass only absorbed up to λ 340, and, as the glass used for screens is very much thinner, this cannot be taken into account. Further than this, it is pointed out that even the thick lenses of the present day are really very transparent to the ultra-violet, and therefore could not make up for the weakness of the screens. The use of aurantia, picric acid, auramine, &c., for making dark-room window screens, ought therefore to be avoided, and it is quite possible that the use of these absorbents may account for many fogged plates. Every material used for blocking out light from the dark room ought to be tested in a quartz spectroscope to see whether it allows any ultra-violet to pass or not. The action of a yellow screen is to cut down the blue and violet so that the maximum action of light may be in the yellow and yellowish green. Our eyes are quite insensitive to the ultra-violet, and cannot discern whether a particular light contains ultra-violet rays or not, and Dr. Buss states it is quite immaterial whether ultra-violet rays play any part in an ordinary orthochromatic exposure or not, as long as they do not increase the action of the blue and violet rays. If we use, therefore, any substance as a yellow screen which absorbs the blue and violet, but which allows the ultra-violet to pass, we permit the latter to intensify the yellow and green, and thus photograph the yellow and green by yellow, green, and ultra-violet rays. A yellow screen, which transmits the ultra-violet will enable us to obtain a stronger action in the yellow and green than one which absorbs the ultra-violet.

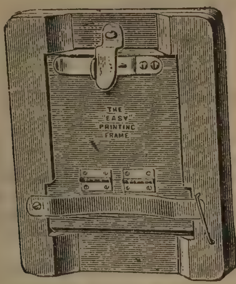
RECENT NOVELTIES IN APPARATUS, &c.

By The Editor.

THE "EASY" PRINTING FRAME.

William Tylar, High-street, Aston, Birmingham.

By rotating the small clip shown at one end of the cut, a portion of the back of this frame, amounting to about two-thirds, is released, thus allowing the photographer to examine nearly the whole of the print, which is securely held



by a spring clamp at the other end of the frame. Hence there is no risk of movement. The frame embodies a useful idea, and should be welcome to both professional and amateur printers.

HOW TO ASSIST THE SIGHT.

J. H. Steward, 403 & 457, Srand, W.C.

This is a clearly written little pamphlet of some fifty pages, giving, in simp language, a short description of the various defects of vision, with test types and instructions for self-testing. Besides hints on the preservation and improvement of the eyesight, there is a chapter on eyesight in relation to rifle shooting by an old contributor to the Almanac, Mr. G. R. Baker.

A NEW FRENA CAMERA.

R. & J. Beck, 68, Cornhill, E.C.

With the title of the "No. 00' (or memorandum size), Messrs. Beck have introduced a new Frena camera, taking films of the size $3\frac{1}{2} \times 2\frac{5}{8}$, and possessing several novel features which constitute it one of the simplest and most effective

little hand cameras that has been shown to us for a considerable time past. The same form of shutter, diaphragms to the lens, the swing back and level, the finders, automatic indicator, and the other features of the larger and more expensive Frena camera have been retained in the memorandum-size Frena, which carries forty films in a pack, as in the other Frena cameras. The operation of changing the film is effected as before by turning the handle round half a revolution and back, but the mechanism of the film changing has been altered.

Fig. 1 shows a side view of the camera. To take out the exposed films, the strap handle having been unbuckled, the back of the camera, O, is removed by

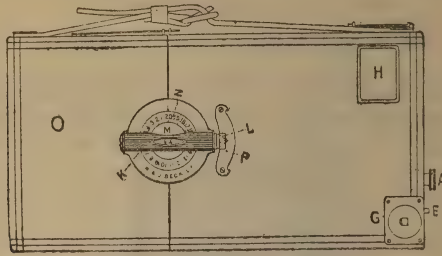


FIG. 1.

undoing the spring catch at the top. The exposed films will be found lying in the back of the camera. It will then be observed that the metal holder which carries the pack of unexposed films, together with the handle, indicator, &c., swings on bearings which fit in semicircular cradles formed by the sides of the camera itself.

This holder may be lifted entirely out of the camera for recharging (figs. 2 and 3). To load the empty camera, a stiff dummy film (fig. 4) is placed in the holder, the packs inserted exactly as supplied by the makers, and the pressure board snapped into position ; the holder is then placed in position in

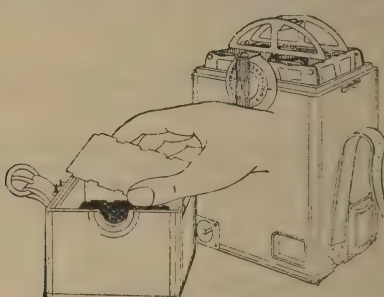


FIG. 2.

the Frena (fig. 2), and the back of the camera snapped on, and the camera is reloaded. The process of changing the film is as follows :—Hold the camera

with its lens pointing upwards towards the sky, and grasp the level handle, K (fig. 1), by the ends, which releases the retaining catch; turn it a complete

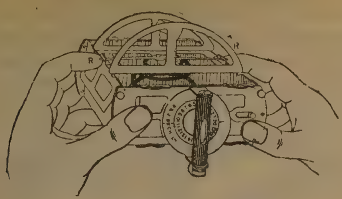


FIG. 3.

half turn in whichever direction it is free to move, and then return it to its original position. As a matter of fact, the operator will find that each time

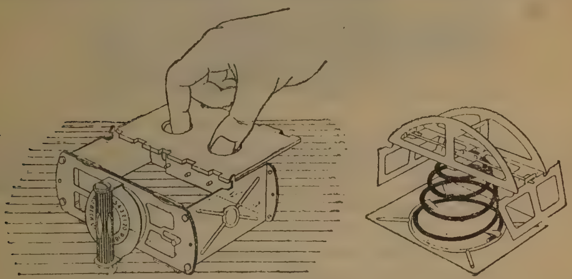


FIG. 4.

a film is changed it is turned in an opposite direction, but, as it cannot be turned in the wrong direction, this is no inconvenience.

The camera has a revolving finder, which may be rotated so as to show the exact image that will be photographed in the vertical or horizontal finder hole respectively, according as to whether a vertical or horizontal picture is being taken.

The shutter has five different speeds, $\frac{1}{5}$, $\frac{1}{10}$, $\frac{1}{20}$, $\frac{1}{40}$, $\frac{1}{80}$ second, and also time exposures. For instantaneous exposures the set-off knob is pushed in, and for time exposures the same set-off knob is pulled out, opening the lens, and then pushed in to close the lens. The speed to which the shutter is set is recorded in the lens aperture. The lens is a single achromatic Beck lens, provided with diaphragms operated by a knob on the front of the camera.

The swing back is obtained by simply tilting the holder in which the films are held until the bubble of the level in the handle is central, whatever the angle of the camera may be. This corrects the distortion that may be caused by pointing the camera up or down.

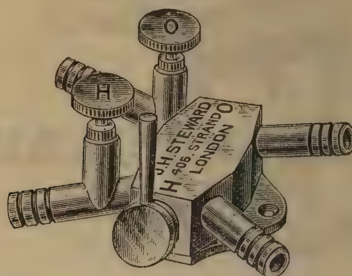
The lens is then stopped down to correct any loss of definition that may be caused by the top and bottom of the film being out of focus. An indicator counts the number of exposures.

The memorandum-size Frena weighs only two and three-quarter pounds, loaded with forty films. It measures $9\frac{1}{2} \times 5 \times 3\frac{1}{2}$ inches.

NEW COMBINED 'CUT-OFF' AND FINE ADJUSTMENT VALVE.

J. H. Steward, 406, Strand, London.

THE value of a 'cut-off' for limelight jets has long since been recognised, for, after once the light has been adjusted to the required height, it can be turned down to a bead and left for any length of time, to be turned up in an instant



to its original height, by simply moving the lever up and down. The addition of screw-down valves to this neat apparatus makes the fine adjustment of the light a certainty. It should be especially useful in microscopic and other projections for enlargements with any jet not provided with these special fittings.

PUMPHREY'S DEVELOPING FILM-HOLDER.

J. Pumphrey, Angelina-street, Birmingham.

THIS film-holder consists of a rectangular frame, made of thin white metal, grooved at the sides. The film is drawn into this frame, which keeps it flat. The frame can be lifted from one vessel to another as required, and the film dried in the same position. It will then be so flat that the operation of printing from it will be greatly facilitated.

THE "OPTIMUS" CANTILEVER ENLARGING APPARATUS.

Perken, Son, & Rayment, Hatton-garden.

THIS instrument has been altered by Messrs. Perken, Son, & Rayment, and now permits enlargements to be made of the various parts of a negative of greater size than that the condenser will entirely cover; thus an apparatus with a six-inch condenser, which is intended to enlarge a quarter-plate negative, will enlarge or copy portions of a half-plate, whole-plate, or even 10 × 8 negative.

This arrangement, we venture to think, will be regarded as a most important desideratum.

TYLAR'S P.O.P, WASHER.

W. Tylar, 41, High-street, Aston.

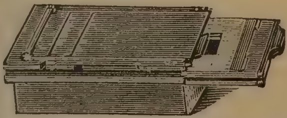
THE features of this handy little washer are—(1) The inlet is so placed that a circular motion is given to the prints, and (2) The position of the outlet

prevent overflow. Once the water is turned on, the washing proceeds neatly and automatically. The P.O.P. Washer is a thoroughly useful and efficacious addition to the amateur's outfit. When using it, Mr. Tylar recommends that the prints be put in one after the other.

THE 'REPEATER' CHANGING BOX.

The Albion Albumenising Company, 96, Bath-street, Glasgow.

THE features of this changing box are that an unlimited number of plates can be changed in full daylight. Plates or films may be exposed at will. There is no heavy box on the camera, as the plates or films are manipulated in a slide



one at a time. The envelopes used for carrying the plates before and during exposure can also be used for storing them.

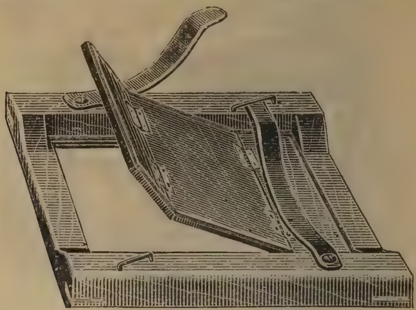
In use, the plates are placed in the light-tight envelopes in the dark room, and sealed. They can then be handled in daylight without fear of fogging. Each plate is placed in the slide singly, and the tag attached to the roller fitting, which, when the shutter is drawn, pulls off the front of the envelope and exposes the plate. After exposure the slide is removed from the camera, and the plate dropped

into a special box. To accomplish this, the slide is attached to the box, and the shutters of the slide and box are drawn together. Inside the changing box is a cardboard box, which holds twelve plates; when filled, this can be removed in full daylight and another substituted, and so on indefinitely.

THE 'MOSELEY' VIEW AND A HALF-PRINTING FRAME.

G. Houghton & Son, 89, High Holborn, W.C.

THIS frame is novel in construction. It has a double-jointed back, which allows of a three-quarter view of the print being obtained at either end, thus permitting every part to be examined. The print is held firmly, so that it

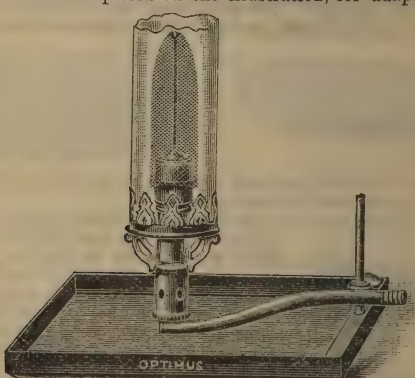


cannot possibly move during examination. The advantage of being able to view the whole of the print without incurring the risk of displacing it should render the 'Moseley' frame very popular.

THE OPTIMUS INCANDESCENT GAS BURNER.

Perken, Son, & Rayment, Hatton-garden.

THE attention given to the use of the incandescent gaslight for projection and enlarging has induced Messrs. Perken, Son, & Rayment to devise the neat little system, which is depicted in the illustration, for adapting the light to

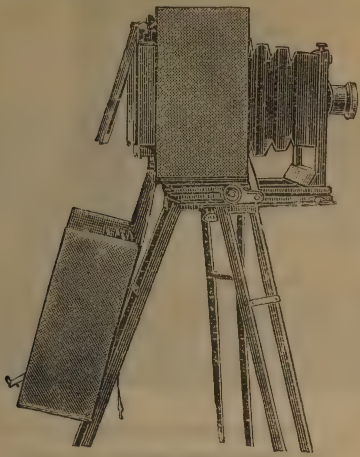


the lantern. It includes burner, glass chimney, brass arm, regulating tap and tray, or the arm only, and the arm and tray can be had separately. The system is easily adapted, and is inexpensive, besides being cleanly in working.

THE AYE READY CAMERA.

The Albion Albumenising Company, 96, Bath-street, Glasgow.

THIS camera, which embodies every necesssary movement, has the further advantage of being complete in its own case. It will be seen from the illus-



tration that, attached to the baseboard of the camera, is a portion of the case in which the camera itself may be packed, and that contains the dark slides. Space is given for other items of apparatus, such as the lens, &c. The camera, when not required for use, packs up in a neat case, and is therefore virtually self-contained.

THE SIMPLEX CHANGING AND DEVELOPING TENT.

F. Beresford, 14, Bridge-road West, Battersea.

MR. BERESFORD'S latest production is a tent, primarily intended for developing on emergency, but also capable of being used for changing purposes. Two metal uprights and a cross piece support the fabric, which is secured by stout elastic to the bottom of the box, forming the base, so that no light can enter. There are large holes for the arms, and an elastically bound face hole fitting just beneath the nose, and so allowing one to breathe freely. When set up, the tent is nineteen inches high, and gives a working space of twenty-two inches by sixteen. Folded up in its box, the measurements are eleven by sixteen by three inches. Three thicknesses of material are used, and perfect light-tightness should therefore be obtained.

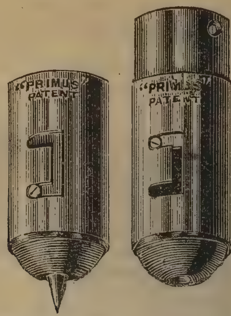
THE 'PRIMUS' TRIPOD POINT.

W. Butcher & Sons, Blackheath.

THIS point keeps the stand from slipping on smooth surfaces, and at the same time has no detachable parts to get lost.

It consists of an ordinary point as now used in the field, and a rubber

button or half sphere, carried by a brass outer sleeve, which is drawn out over the ordinary point, and is kept in position by a slot and pin when working



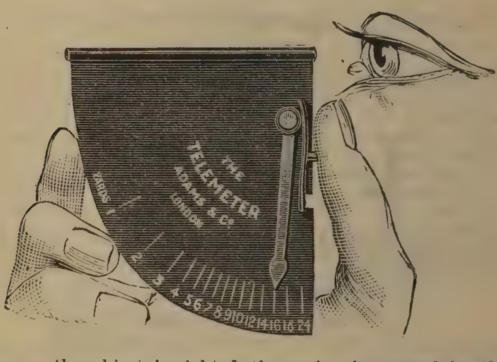
upon smooth surfaces. The use of the points prevents the tripod from slipping, no matter how smooth the surface.

The weight scarcely exceeds the ordinary point. They also form a protection to the points when the stand is folded up, preventing their damaging or scratching other articles or the clothing. Being all one, they form part of the stand, and cannot be detached, either intentionally or by accident.

THE ADAMS TELEMETER.

Adams & Co., Charing Cross-road, W.C.

THIS is a simple device for enabling a hand camera worker to judge of the distance of an object he is photographing. In use, the telemeter is held (as shown in the illustration) close to the eye. The tube through which the eye looks is pointed to the base of the object, towards which the eye is directed,

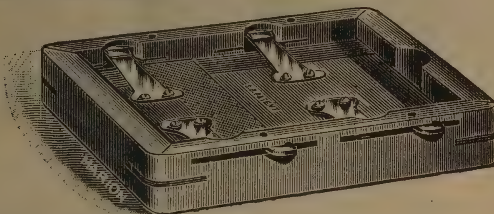


and, as soon as the object is sighted, the spring is pressed by the thumb. This fixes the indicator, and the distance in yards may then be read off. We have subjected the telemeter to test measurement, and find it accurate.

THE 'S. B.' PRINTING FRAME.

Marion & Co., Soho-square, W.

THE advantages claimed for this printing frame are that it is neat; occupies a small space; that the fixing of the back in position is done by means of a downward movement only, thus obviating any possibility of displacing the print, and that evenness of pressure over the whole of the plate and quickness of working are also obtained.

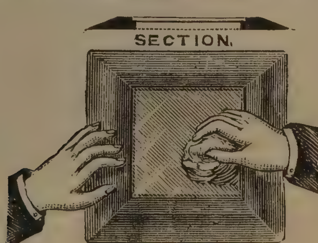


The back of the printing frame is released by four small spring catches shown in the illustration, and the back itself, being unequally divided, allows of rather more than half the print being examined when occasion demands. It is a capital frame, and, especially for securing perfection of contact in printing, a point not always assured with ordinary printing frames, should be found very useful.

THE 'PRIMUS' GLASS-CLEANING APPARATUS.

W. Butcher & Son, Blackheath.

THIS is a neat frame made in ash, and mitred and tongued together at the corners; the glass is laid in the rebate of same and is cleaned one side, then reversed and cleaned the other side. The glass can be handled by the edges



throughout, thus avoiding any finger-marks, &c. All photographers who clean glass for wet-plate work, lantern-work and other uses, will appreciate this simple addition to their resources.

THE STEREO-PHOTO-DUPLICON.

Jonathan Fallowfield, 146, Charing Cross-road, W.C.

THE Stereo-photo-duplicon is the name of a piece of apparatus introduced by Mr. Fallowfield, which enables a binocular photograph to be taken by means of a camera carrying only one lens.

Reference to fig. 1 will make clear the fact that the instrument is based upon the principle of double reflection—two sets of inclined mirrors trans-

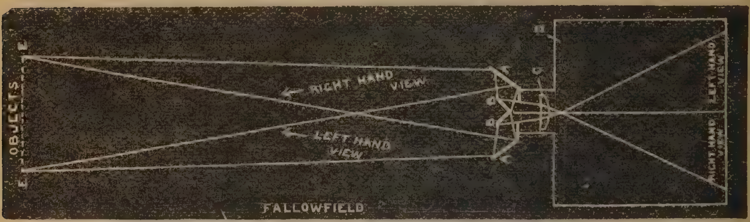


Fig. 1.

mitting the two images of the view or object photographed through the lens, and, as it is pointed out, in such relative positions that, when prints come to be made from the negative, cutting and transposition are obviated.

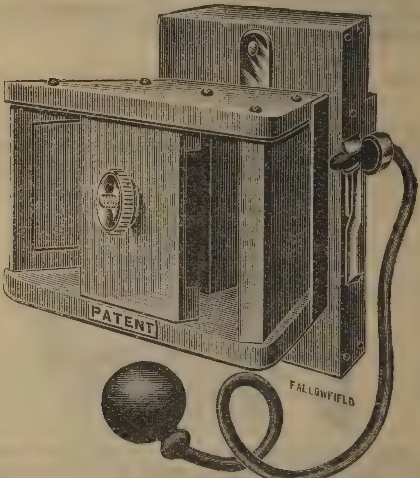


Fig. 2.

Fig. 2 gives a front view of the instrument, which is fitted with a time and instantaneous shutter, and may be affixed to either a hand or stand camera.

It is a very simple and effective way of making stereoscopic pictures by means of a single lens.

THE RADIANT VIEW-FINDER.

Marion & Co., Soho-square, W.

THIS Finder, the construction of which is indicated by fig. 2 gives, from its nature, a very brilliant image, and therefore is sure to be much appreciated by hand-camera workers. No mirror or ground-glass screen is employed, and a totally reflected image is obtained, which, it need scarcely be said, is a condition that makes a finder, as such, the very best *sui generis*. The illustrations, given actual size, are explanatory of the manner in which the Radiant Finder is attachable to the camera, and it is also described below.

FIG. 1.

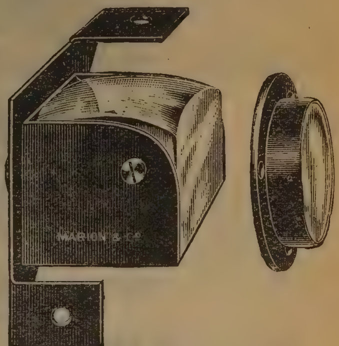


FIG. 2.

Fig. 1 is designed for use on any camera, and is fitted with a rotating plate showing both vertical and horizontal views. In the base there are two key-hole slots for fixing to the camera by two round-head screws at top and side, placed with centres exactly one inch apart and in a line with the axis of the lens.

Fig. 2 is the form for insertion in hand cameras, one serving for both vertical and horizontal views by simply rotating it through an angle of 90°.

THE CENTRAL OXYGEN WORKS.

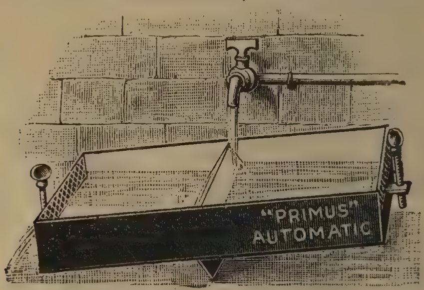
Sheffield-street, Lincoln's Inn-fields.

WE recently paid a brief visit to the Central Oxygen Works, which are situated right in the heart of theatrical London, and for this and other reasons will, no doubt, prove a great convenience to users of compressed gases. The works, under new proprietorship, are receiving large orders for gas from the War Department, hospitals, &c., a circumstance which necessitates the putting down of additional furnaces and machinery. The oxygen, which is, of course, produced by the well-known barium process, which we have very frequently described, has a guaranteed purity of from 96 to 98 per cent. The plant at the works appears to be of the latest and most approved type, and very rigid precautions are taken to prevent unsuitable cylinders being filled and sent out. A hydrogen compressing plant also forms part of the installation. The works are very complete for their special purposes, workshops for the repair of valves, &c., cylinder testing rooms, &c., forming part of the premises. The Central Oxygen works bid fair to take a prominent place in the manufacture and supply of compressed gas.

'PRIMUS' WASHING TRAY.

W. Butcher & Son, Blackheath.

This is automatic in action, and may be used for either negatives or prints. The tray is placed under a stream of water, so that it falls *on* the pyramidal

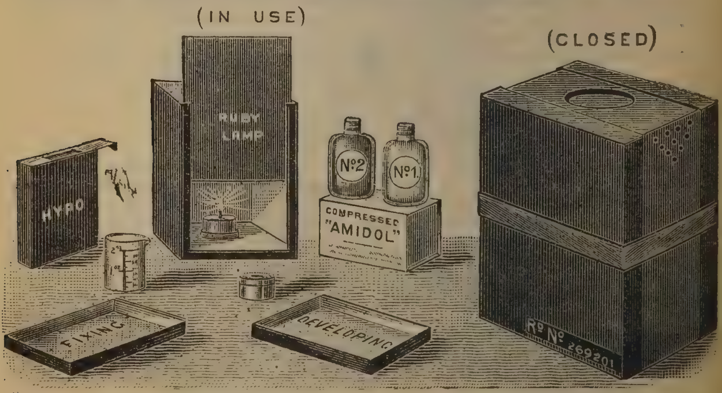


division, and into the half of the tray which is off the ground. This half, when full, tilts up the other half, and so causes the stream to fall into the other half. The rise and fall—in other words, the rocking—is adjusted by means of the screws at each end.

THE 'TRAVELLER' DEVELOPING SET.

R. & J. Beck, Cornhill, E.C.

This is a handy little set, that packs up into an extremely small compass, which should be found very useful to those who, when travelling, have little space to spare for their photographic impedimenta. It consists of a ruby lantern, the protecting covers of which serve as developing trays. A partitioned case carries a measure, night light, and granulated hypo. Concen-



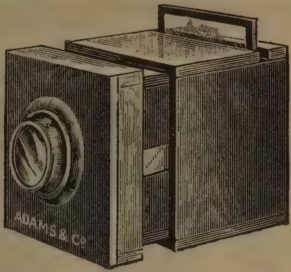
trated developers in dry powder are given. The trays are coated with a tough enamel, which is proof against acids and alkalies. The measure is of a con-

venient form for dissolving the developer. The developer is contained in two small bottles with screw caps, which serve as measures when mixing a solution for use, no weighing being required. The hyposulphite occupies the minimum of space.

It is a compact little set, and capable of being very useful to the traveller. The size of the closed packet is about $5 \times 4 \times 3$ inches.

ADAMS'S POPULAR PANTASCOPE.

THIS is a handy little instrument, for viewing lantern slides, issued by Messrs. Adams & Co., of Charing Cross-road, W.C. The slide is placed in the slot, as

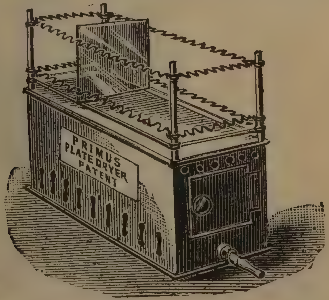


shown, and is viewed through the eyepiece, against ground glass. Excellent and almost stereoscopic-like effects are obtained by examining slides in this way. The Pantascope will be found a companionable addition to one's photographic instruments.

'PRIMUS' PLATE-DRYER.

W. Butcher & Son, Blackheath.

As indicated by the illustration, the plates are supported in wire grooves on the top of the heating plate. Underneath the plate is a box, which forms the heating chamber, through which an atmospheric gas burner runs, and is con-



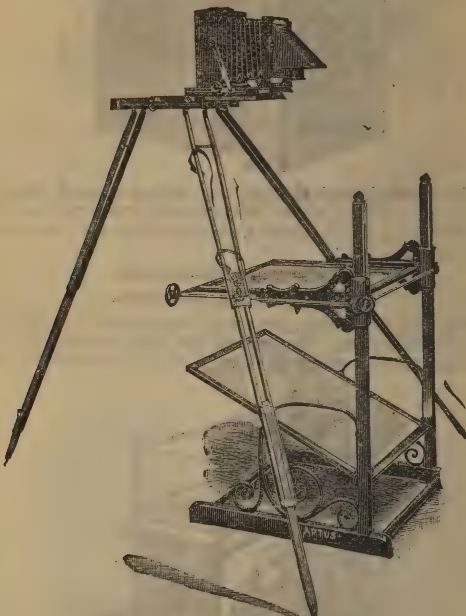
nected with the house gas by a piece of indiarubber tubing. It is claimed that plates may be dried by this method in ten minutes, and, intelligently used, it is one that should be found very acceptable when an amateur desires to quickly dry a negative.

THE "APTUS" MUSEUM STAND AND CAMERA.

Sharp & Hitchmough, 101, Dale-street, Liverpool.

THIS apparatus is strongly yet lightly made, and capable of use with a rectilinear, wide-angle, or tele-photo lens, and is suitable for outside work, such as botanical and geological studies, the photographing of wild birds, &c., in their native haunts. But, above all, it is quickly adaptable to photograph objects either directly above or below it without altering its horizontal position. It can be used for copying such objects as ornamental ceilings, inscriptions, &c., or, in fact, any subject immediately overhead ; and for photographing, without distortion, anything on a lower horizontal plane, such as growing plants, collections of shells, jewels, pathological preparations, or other fragile and delicate objects which could not be conveniently fixed in a vertical position.

The focussing is effected at the back of the camera by the ordinary rack-and-pinion movement, instead of by the lens, thereby saving a vast amount of



trouble in arriving at the correct size of image. The tripod head is specially constructed with a forward extension, so that the camera may be brought directly over fixed show-cases, &c., with a minimum of trouble.

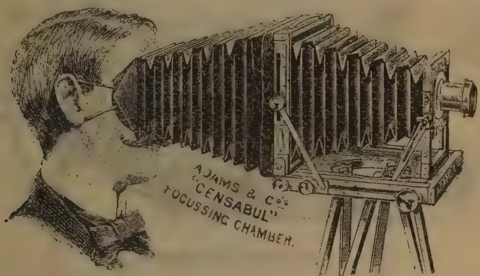
By the insertion of a prism between the combinations of a rectilinear lens, objects at right angles to the camera, and which would be quite inaccessible to the ordinary instrument, may be copied with the greatest ease. The stand is fitted with a glass platform, which may be raised or lowered by a rack and

pinion, and will be found exceedingly useful for photographing many subjects where it is essential to preserve the rotundity or solidity of form. The ofttimes unpleasant effect of cast shadows is entirely obviated by the transparency of the supporting medium, and the reflected light from an opal glass below, which can easily be adjusted to any desired angle. Should the object be of a transparent nature, a suitable background can be immediately affixed by covering the reflector with a piece of black or covered velvet.

ADAMS' "CENSABUL" FOCUSSING CHAMBER.

Adams & Co., Charing Cross-road, W.C.

THIS arrangement overcomes all the objections of a focussing cloth, as with it there is no blowing or falling off. It can be used by a lady without dis-

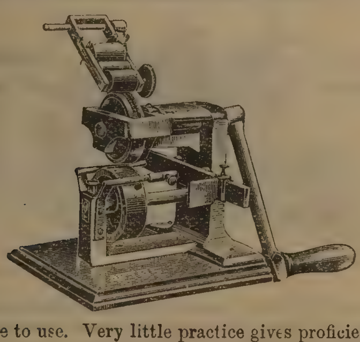


arranging her hair or hat, and gives a full view of the screen in any position. There is no sagging of the centre as in ordinary kinds. It is adjusted to the camera by elastic, and is much smaller than a focussing cloth.

THE "APTUS" BLOCKING MACHINE.

Sharp & Hitchmough, 101, Dale-street, Liverpool.

PLAIN or coloured blocking may be produced by this little machine, which is



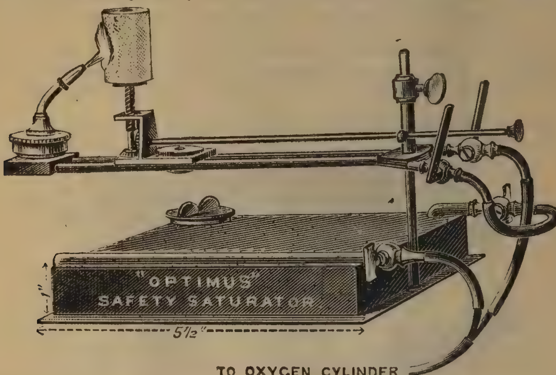
exceedingly simple to use. Very little practice gives proficiency in working it, the main point to consider being, when using ink, not to apply too much of it.

THE "OPTIMUS" SAFETY SATURATOR FOR OPTICAL LANTERN ILLUMINATION.

Perken, Son, & Rayment, Hatton-garden.

THE model now issued by Messrs. Perken, Son, & Rayment has decided advantages over that formerly sold.

The body of the Saturator is now made half an inch deeper, and so contains an increased quantity of non-inflammable absorbent material, thus



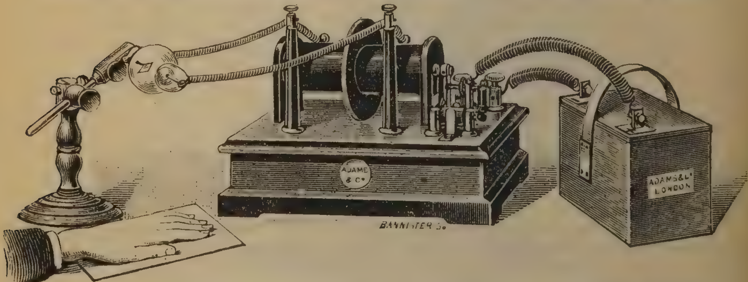
lengthening the duration of time of continuous illumination from two to fully three hours.

Draining all liquid either from the body of the saturator, before lighting, is now rendered simple and absolutely certain by the addition, near the bottom of the vessel, of an aperture securely closed by a screw plug.

ADAMS' RÖNTGEN RAY APPARATUS.

Adams & Co., Charing Cross-road, W.C.

THESE coils are Messrs. Adams' own manufacture. It is found that a 4-inch



gives excellent results. Each is fitted up upon polished and figured walnut stand, with ample platinium contacts, and special care is taken to ensure thorough insulation in the coils.

THE ACETYLENE LIGHT FOR PORTRAITURE, ETC.

THE illustration shows Messrs. Thorn & Hoddle's method of utilising generated acetylene for studio purposes, or for use in taking drawing-room or ball-

room portraits. Inside the reflector are twelve 60 candle-power burners. The method of generating and using acetylene is described elsewhere in the ALMANAC. It is only necessary for us here to remark that the light is admirably suited for portraiture.

ANIMATED PHOTOGRAPHS ON THE SCREEN—A NEW PROJECTION APPARATUS.

Watson & Sons, 313, High Holborn.

IMMENSE interest has been created by the introduction of machines for the production, on the screen, of animated pictures; but, hitherto, the necessary apparatus has been beyond the reach of the amateur on account of the large sums that have been charged for them.

We are, however, pleased to announce that Messrs. Watson & Sons, of 313, High Holborn, London, W.C., are putting on the market an apparatus at a cost which will enable persons, who are so disposed, to employ it at home, in schoolrooms, &c. It consists of a strongly-made wooden box, measuring $6 \times 4\frac{5}{8} \times 5\frac{1}{2}$ inches, in which the mechanism is contained. It is proposed that this shall be used in combination with existing magic lanterns, the lens from the magic lantern being, of course, removed. All that would be necessary would be a supporting base to make the centres of the lantern and the new apparatus coincident.

This little machine, when working, is wonderfully free from vibration, and is different in construction to any other machine that we have seen. Further, it will afford amateurs an opportunity of taking their own pictures, for it is so

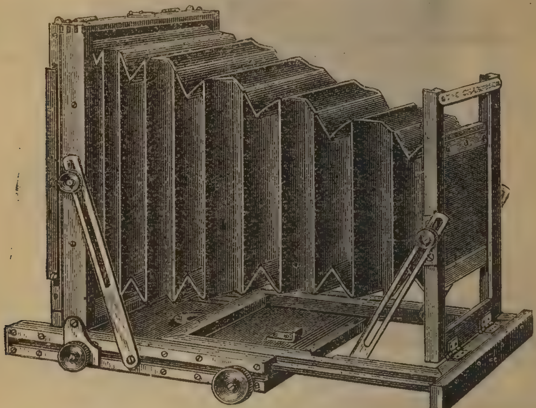
made that any one, who may wish to do so, can expose film and obtain their own negatives.

A double combination projection lens is included with the apparatus. It may be supposed that this is more a toy than a practical instrument, but this is quite a mistake, for it will do all the work of the most expensive machines that are at present in vogue.

THE APEX SET.

W. Emery, Soho-street, Soho-square.

Mr. Emery has shown us a useful set of apparatus which appeals to photographers of limited resources who desire efficient apparatus. The camera is of the most modern type, having double extension, rising front, swing back,



and reversing back, and is capable of being used with wide-angle lenses. It is a well-made, light, and elegant instrument. The set includes one double back, a light and rigid tripod, focussing cloth, and waterproof case. It is very cheap, as are the lenses supplied.

THE ACME PRINT-TRIMMER.

H. J. Redfern, 55, Surrey-street, Sheffield.

This wheel trimmer (which sells at 2*s.*) will soon repay the outlay, as it is a handy addition to one's photographic resources. It has a bevelled hollow wheel (Sheffield made), and cuts wet or dry paper equally well. The wheels

and screws are interchangeable, and can be replaced at a small outlay. Again, owing to the wheel being hollow, with the cutting edge flat, it can readily be sharpened to a razor-like edge merely by rubbing on an ordinary oil stone. The Acme Print-trimmer is well and strongly made, and we can recommend it as a capital tool.

"PRIMUS" PHOTOGRAVETTE.

W. Butcher & Son, Blackheath.

THIS is a simple arrangement permitting of contact negatives being made from pictures in books, &c.

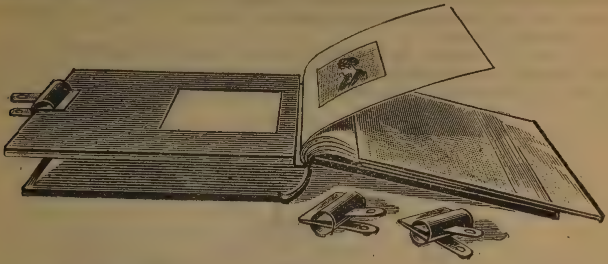


FIG. 1.

Fig. 1 represents the baseboard and carrier, with the plate placed in position in the book, film side upwards.

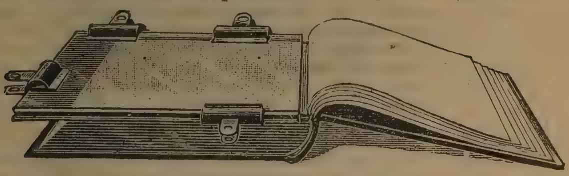


FIG. 2.

Fig. 2 represents the picture to be copied folded over on to the plate with the back of same uppermost; a glass plate is also placed over this, and the whole clamped together by means of the four clips.

The apparatus consists of a stiff baseboard, a carrier for the sensitive plate, a thick cover glass, and four strong clips. Contact between the sensitive plate and the print to be copied having been made (of course in the dark room) exposure is made to artificial light, and development is pursued in the usual way.

This method of copying by contact will, no doubt, be found useful by many in emergency.

CINEMATOGRAPH FILM.

MESSRS. FITCH & Co., of Fulwoods Rents, the well-known pioneers of celluloid films in this country, are determined to be well to the fore in respect to their speciality, and are placing on the market a film possessing all the usual good qualities, and calculated to produce the most perfect results for cinematograph work.

The film will be Edison gauge and supplied ready perforated, giving clear, dense pictures with the utmost rapidity.

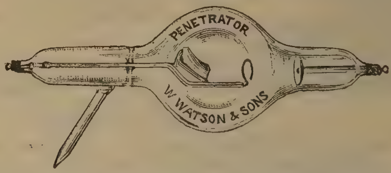
It goes without saying that any new venture introduced under the able superintendence of Mr. Fitch is of itself a guarantee of merit, and we shall expect to hear great things of these new films in the near future.

THE PENETRATOR FOCUS TUBE.

W. Watson & Sons, 313, High Holborn, W.C.

EVERY advance which is made in connexion with radiography, that tends to shorten exposures, to penetrate increased density of structure, or to give more brilliant and definite effects with a fluorescent screen, is looked for eagerly by all workers with X rays.

At the end of October, Messrs. Watson placed upon the market a new form of tube which they designated the "Penetrator," and which is shown in the accompanying illustration. In their hands, they inform us, it yielded results



that were greatly in advance of anything that had been done with the ordinary focus tube; but, before stating this as an actual fact, they submitted samples to all the well-known workers, the unanimous opinion of whom was that the tube was more luminescent on the fluorescent screen, and shortened exposures radiographically. The special features of this tube are, that the platinum disc, from which the X rays emanate, is insulated from the anode. The anode is a small ring which is shown in the middle of the tube, and serves the purpose of confining the whole of the cathodic stream so that it impinges upon the platinum. The resulting glow in the lamp does not pervade the whole area of the glass, but is concentrated upon one portion. There is, therefore, no lost effect. The tube is also so constructed that the vacuum is very amenable to external heat, and, unlike the ordinary focus tube, can be used many times over without intermission. The tube has other good practical points, and is made of exceedingly thin glass.

THE PHOTO-AUTOCOPYIST.

The Autocopyist Co., 72, London Wall, E.C.

THE Photo-autocopyist is a simplified form of collotype printing, which, as we have already mentioned in the pages of the JOURNAL, gives excellent results with very little trouble. For the benefit of those of our readers who are unacquainted with the system employed, we here append a brief description of working the process with the apparatus supplied :—

A Photo-autocopyist gelatine sheet replaces the bichromatised gelatine on glass plates as used in collotype printing.

It is sufficient to soak the sheet for a few minutes in a solution of bichromate of potash of two to three per cent., and, when dry, to expose it to the light in an ordinary printing-frame, underneath the negative, in the same way as one would make a print on albumenised paper.

When it is sufficiently printed, which can be readily seen by opening the back of the printing frame and examining in the usual way, the Photo-autocopyist sheet is taken out of the frame, and soaked in water until the bichromate has been entirely washed out. The sheet thus prepared will constitute the printing surface, and enable the photographer to take from it several hundreds of copies, which, as regards neatness, will compare very favourably with the best photographic prints.

The Photo-autocopyist sheet is then taken out of the water, and stretched

on the special frame supplied with the apparatus, and inked with the ink roller, the ink only adhering to the indented parts which have been acted upon through the negative; ordinary paper is then placed upon the inked surface and pressed in the ordinary office copying press, taken out at once, when a perfect print is obtained. The average time in making a print is two minutes.

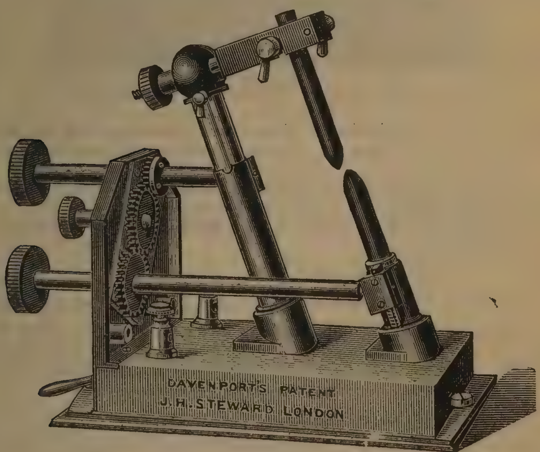
From the Photo autocopyist sheet further prints can be taken at intervals, even after some years.

A feature of the process is that writing, drawing, music, plans, &c.—in fact anything that can be written or drawn with an ordinary pen on ordinary paper can be reproduced on this apparatus in permanent black equal to lithography, by an additional outlay for a supply of differently prepared sheets, and a supply of writing ink, &c.

STEWARD'S IMPROVED ELECTRIC ARC LAMP.

J. H. Steward, 406, Strand.

An improved model of Davenport's patent arc lamp has been made by Mr. J. H. Steward, of 406, Strand, London, and recently placed upon the market. It has been designed by the inventor to cover all possible uses for projection purposes, and will safely take the stronger current necessary for high-power illumination. The size of carbons can be either 8×10 mm. or 10×12 mm.,

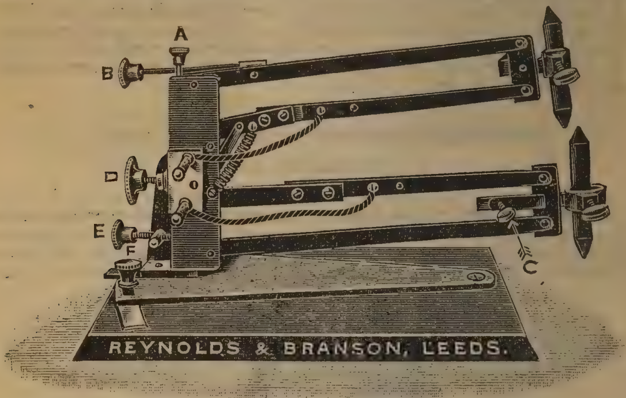


and the method of feeding them by geared wheels is such that they can be made to approach each other at the proper ratio, or, on slightly drawing out the central rod, each carbon can be moved independently. All necessary adjustments are provided to the carbons, and to the base, for perfect centering. The lamp, or regulator, is strongly made, and aluminium is employed for the back and base, to reduce the weight. We understand the Lantern Society used one for the latter part of last session, and the report on its working was most satisfactory.

REYNOLDS & BRANSON'S ARC LAMP FOR THE OPTICAL LANTERN.

Reynolds & Branson, Leeds.

THIS Arc Lamp has all the usual movements, but differs from others of its kind in that it possesses a parallel feed, the carbons thus travelling in a straight line. In use, one carbon is set slightly in advance, so that the arc is thus arranged to give a maximum illumination in the direction of the condenser. We are informed that, with a continuance current of fifty volts, very



satisfactory results are obtained. Expert tests have also been applied to the lamp with satisfactory results. Messrs. Ross have the London agency of the lamp.

The Reynolds & Branson Arc Lamp is extremely well made and compact. The adjustments, lateral and vertical, work very smoothly, and have evidently been arrived at from great practical knowledge of what is required in a lamp of this description.

THE BULL'S-EYE CAMERA.

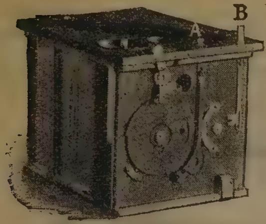
The Eastman Photographic Materials Company, 115, Oxford-street, W.

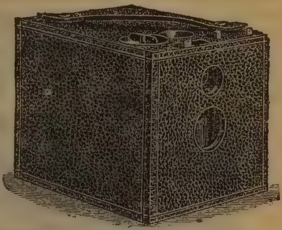
OUR photographic companion on the occasion of a recent trip was a Bull's-eye camera, and we are therefore enabled to speak from practical experience as to the working of what is at once an ingenious and workmanlike little instrument, more especially with reference to the immense convenience it allows of daylight changing.

Here is the system briefly described. The body of the camera is removed from its outer case, and the spool of sensitive celluloid (which is, of course, covered with light-tight paper) is placed in position. The paper covering is cut, threaded under cross pieces and over rollers into the slot of a reel, upon which, by turning a key, it is tightly secured, and the body of the camera is then replaced in its case. A few more revolutions of the key are made until, from the back of the camera, it is seen, through an aperture of red glass, that No. 1 film is in position. The exposure is made, No. 2 is turned into position, exposed, and so on down the whole available length of the film. When the last exposure is made, film and paper are tightly wound round the reel, and are then removed from the camera, the gummed edge of the paper moistened

and secured, and there is your reel of exposed film safely to be handled in daylight, the while a fresh spool of unexposed film is placed in the camera ready for use.

The little camera, which gives pictures $3\frac{1}{2} \times 3\frac{1}{2}$, is a cleverly thought-out





piece of apparatus, and in use is the *beau idéal* of a simple and effective snap-shot instrument. It is fitted with a finder, a controllable shutter, and diaphragm plate. The convenience of daylight changing should make it a great favourite with those—an increasing number—of whom a hand camera of some kind is almost an inseparable companion.

THE PARASTUDIO.

W. Watson, 130, West Graham-street, Glasgow.

A MODEL of the Parastudio was submitted to us for inspection by its inventor, Mr. W. Watson. It is intended for controlling the light in outdoor portraiture. It may briefly be described as consisting of a light metal tripod stand

with a species of umbrella attached, which is adjustable at various angles. The whole thing by the aid of a fabric adapter can be converted into a tent. The Parastudio embodies a good idea, and for garden portraiture should be found useful in controlling the light as circumstances dictate.

PUMPHREY'S STAMP PHOTOGRAPHS.

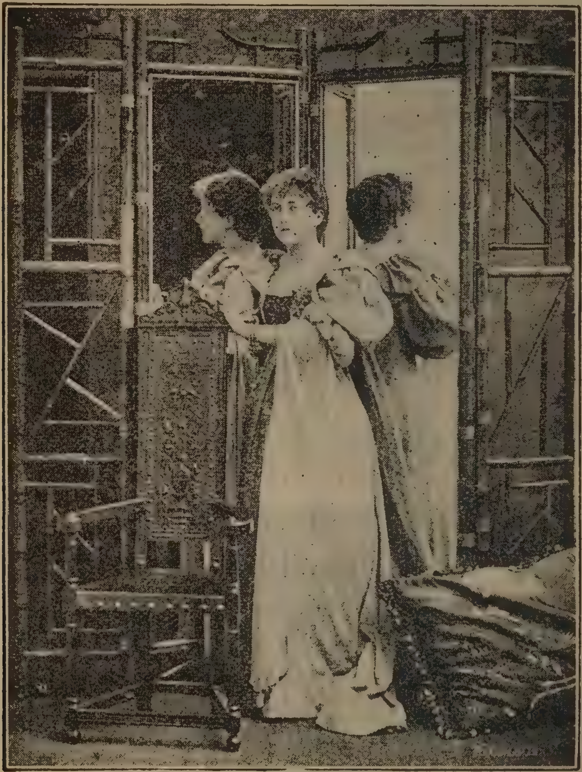
A. Pumphrey, Camp Hill Works, Stanhope-street, Birmingham.

MR. PUMPHREY'S stamp-size photographs are produced in sheets of fifteen, ready gummed and perforated, price 1*s.* 6*d.* For 2*s.* the portraits are mounted on small cards with names and addresses.

MARION'S LARGE BAMBOO DOUBLE MIRROR.

Marion & Co., Soho-square, London.

THE useful accessory here illustrated will, doubtless, be found of great service in the professional studio. The mirrors are five feet long and two feet broad



From a photo by W. & D. Downey, Ebury-street.

and are of plate. Full-length reflections are to be obtained, and it can easily be seen that many novel poses will suggest themselves to the photographer. The whole is of solid bamboo on casters.

FORMULÆ.

WITH the view of enabling the readers of the ALMANAC to find, more readily than hitherto, any particular one of the following numerous Formulæ or Tables, we give below an Index to the Contents of this section of the ALMANAC, which will doubtless facilitate reference.

DEVELOPING FORMULÆ FOR GELATINE DRY PLATES, ETC.

THE following are a few of the typical formulæ that are generally employed for development, &c.; a much greater variety will be found in the section headed 'Developing Formulæ of the Principal Plate-makers' (p, 903), to which we also refer the reader.

PYRO SODA.

No. 1.	A.	Sulphite of soda	6 ounces.
		Water	32 ,,
		Pyrogallic acid	1 ounce.

(Having dissolved the sulphite of soda, add sufficient citric acid in solution to cause a piece of blue litmus paper inserted therein to become reddened.)

	B.	Carbonate of soda	3 ounces.
		Carbonate of potash	1 ounce.
		Water	32 ounces.

When about to develop, mix these in equal proportions with two parts the bulk of water, or, if the weather be *very* hot at the time, even a greater proportion of water.

No. 2.	A.	Sulphite of soda (crystals)	2 ounces.
		Citric acid	60 grains.
		Ammonium bromide	40 ,,
		Pyro	1 ounce.
		Water	12 ounces.
	B.	Sulphite of soda (crystals)	2 ounces.
		Carbonate potassium (crystals)	3 ,,
		Water	12 ,,

To develop, use 1 drachm of each to 2 ounces of water.

PYRO AND AMMONIA.

No. 1.	Strong liquid ammonia	2 ounces.
	Bromide potassium	300 grains.
	Water	80 ounces.
No. 2.	Pyrogallic Acid	20 grains.
	Water	10 ounces.
	Nitric acid	2 drops.

For use take equal parts.

FERROUS OXALATE.

No. 1.	Saturated solution of sulphate of iron	1 part.
	Saturated solution of oxalate of potash	3 parts.

Mix *quant. suff.* by pouring the iron into the oxalate. In hot weather the proportion of the iron solution may be diminished with advantage.

For Transparencies on Gelatino-Chloride Plates.

No. 2.	A.	Neutral oxalate of potash	2 ounces.
		Chloride of ammonium	40 grains.
		Distilled water	20 ounces.
	B.	Sulphate of iron	4 drachms.
		Citric acid	2 ,,
		Alum	2 ,,
		Distilled water	16 ounces.

For black tones mix the above in equal volumes.

METOL.

Single-solution Developer.

Metol	40 grains.
Sulphite of soda	120 ,,
Hydroquinone	48 ,,
Carbonate of potash	240 ,,
Water	8 ounces.

Apply heat if necessary to dissolve the metol, and afterwards add the sulphite, and allow that to dissolve before adding the other ingredients.

For use under normal conditions, one part of the above is to be diluted with three parts of water.

Two-solution Developer.

A.	Metol	40 grains.
	Hydroquinone	48 ,,
	Sulphite of soda	120 ,,
	Water	8 ounces.
B.	Carbonate of potash	1 ounce.
	Water	1 quart.

For use, mix one part of A with three parts of B for ordinary exposures; for over-exposures use less of B, or else add a few drops of a ten per cent. solution of bromide of potassium, or of a five per cent. solution of citric acid; for slight under-exposure, increase B.

Three-solution Developer.

A.	Metol	40 grains.
	Sulphite of soda	120 ,,
	Water	8 ounces.
B.	Hydroquinone	40 grains.
	Citric acid	10 ,,
	Water	8 ounces.
C.	Carbonate of potash	1 ounce.
	Water	20 ounces.

For use under similar conditions to those already mentioned, take one part each of A and B and two parts of C.

METOL-HAUFF.

Solution A.

Water	100 parts.
Metol	1 part.
Soda sulphite	10 parts.

Solution B.

Water	100 parts.
Carbonate potash (or substitute)	10 ,,
Crystallised carbonate soda	20 ,,

For use, three parts A to one of B, with 40 minims of bromide of potassium solution (1:10).

METOL-ANDRESEN.

Water	1	quart.
Metol	¾	ounce.
Sulphite of soda	7	ounces.
Carbonate of potash	3½	"
Bromide of potassium	$\frac{1}{10}$	ounce.

To photographers who prefer to work with separate solutions the following is recommended:—

A.	Water	1	quart.
	Metol	¾	ounce.
	Sulphite of soda	7	ounces.
B.	Water	3	quarts.
	Carbonate of soda	7	ounces.

Of these one part of A is mixed with three parts of water for use, bromide of potassium being added as required for the prevention of fogging.

ANDRESEN'S GLYCIN.

I. For soft development:

Solution A (warm slightly).

Glycin	4	parts.
Carbonate of potash	1½	"
Sulphite of soda (cryst.)	12	"
Water	100	"

Solution B.

Carbonate of potash	10	"
Water	100	"

For use mix one part of *A* with two parts of *B*.

II. For hard development:

Glycin	5	parts.
Carbonate of potash	25	"
Sulphite of soda (cryst.)	25	"
Water	100	"

For use to be diluted three times its volume.

GLYCIN-HAUFF.

The concentrated developer is made up as follows:—350 grains of sodium sulphite crystal are dissolved in one ounce of water, 150 grains of glycin are then added and heated to boiling point, and one and a half ounces of potash carbonate are added (begin adding the potash in small quantities, on account of the carbonic acid gas). When cold, this concentrated developer—forming a thin, pasty solution—may be kept as stock. For use, shake the solution first, and dilute the required quantity twelve times for ordinary purposes. For use when development is to be left to itself the stock solution is diluted fifty times.

A One-solution Formula.

Sodium sulphite	40 grains.
Glycin	20 ,,
Potassium carbonate	80 ,,
Water	4 ounces.

PARA-AMIDOPHENOL.

Para-amidophenol chlorhydrate	5 grammes.
Crystallised carbonate of sodium	50 ,,
Crystallised sulphite of sodium	50 ,,
Water	1000 ,,

For use, dilute with an equal bulk of water.

Para-amidophenol hydrochlorate	60 grains.
Sodium sulphite	60 ,,
,, carbonate	400 ,,
Water	20 ounces.

Dr. Andresen's Formula.

Para-amidophenol chlorhydrate	8 parts.
Sodium sulphite	80 ,,
,, carbonate	40 ,,
Water	1000 ,,

AMIDOL.

Amidol	80 grains.
Sodium sulphite	800 ,,
Water	8 ounces.

For use, one ounce of the solution is diluted with three ounces of water, with one and a half grains of potassium bromide to the ounce of developer.

EIKONOGEN.

No. 1.	A.	Crystalline sulphite of soda	40 grammes.
		Eikonogen	3 ,,
		Distilled water	500 c.cm.
	B.	Carbonate of potash (or calcined soda)	60 to 75 grammes.
		Distilled water	500 c.cm.

For use, mix equal volumes of A and B.

ONE-SOLUTION DEVELOPER.

Sulphite of soda in crystals	8 ounces.
Carbonate of soda in crystals	3 ,,
Distilled water	80 ,,
Eikonogen	1 ounce.

HYDROQUINONE.

No. 1.		Hydroquinone	1 part.
		Sulphite of soda	2 parts.
		Carbonate of soda	10 ,,
		Water	67 ,,
No. 2.	A.	Hydroquinone	4 grains.
		Metabisulphite of potash	4 ,,
		Bromide of potassium	1 grain.
		Distilled water	1 ounce.
	B.	Potassium hydrate	10 grains.
		Distilled water	1 ounce.

Equal parts of A and B.

With some plates the bromide may be omitted.

No. 3.	A.	Hydroquinone	80 grains.
		Citric acid	10 ,,
		Sulphite of soda (recrystallised)	80 ,,
		Distilled water	20 ounces.
	B.	Caustic potash (fused)	160 grains.
		Sulphite of soda	160 ,,
		Distilled water	20 ounces.

C.	Bromide of potassium	24 grains.
	Distilled water	1 ounce.
D.	Caustic potash	160 grains.
	Distilled water	20 ounces.

For normal exposures use equal parts of A and B, adding five minims of C for every ounce of solution.

For over-exposed plates use D instead of B, with an extra quantity of C.

For under-exposed plates omit C, and in extreme cases add six or eight grains more of sulphite of soda to each ounce of the developer. The object of increasing or decreasing the quantity of sulphite is to give greater or lesser density.

No. 4.	A.	Hydroquinone	160 grains.
		Sulphite of soda	2 ounces.
		Citric acid	60 grains.
		Bromide of ammonium	20 ,,
		Water to	20 ounces.
	B.	Carbonate of potash	2 ounces.
		Carbonate of soda (crystal)	2 ,,
		Water to	20 ,,

Take equal parts.

No. 5.	A.	Hydroquinone	15 grains.
		Sulphite of soda	75 ,,
		Water	5 ounces.
	B.	Carbonate of potash	90 grains.
		Water	5 ounces.

C. Ten per cent. solution of bromide of potassium.

Use equal parts of A and B, and add two or three minims of C. With some plates no bromide restrainer will be required.

No 6.	Sulphite of soda	40 grammes.
	Hydroquinone	5 ,,
	Carbonate of soda	75 ,,
	Water	200 c.c.

For use, dilute ten c.c. with water to thirty-five c.c.

For a single stock solution prepare as follows :—

No. 7.	A.	Hydroquinone	50 grains.
		Metabisulphite of potash	80 ,,
		Water	4 ounces.

B.	Carbonate of potash	840 grains.
	Water	4 ounces.

Filter solution B, and then mix A and B.

For use, take half an ounce of this solution and add to five ounces of water.

FOR CHLORIDE PLATES.

Hydroquinone	2 grains.
Sulphite of soda	10 ,,
Carbonate of ammonia (or pot.)	10 ,,
Bromide of potassium	$\frac{1}{10}$ grain.
Water	1 ounce.

DEVELOPING FORMULÆ, ETC., OF THE PRINCIPAL PLATE-MAKERS.

AUSTIN EDWARDS'S FORMULÆ.

PYRO.

No. 1.	Pyrogallic acid	1 ounce.
	Nitric acid	20 drops.
	Water	80 ounces.
No. 2.	Sulphite of soda	10 ounces.
	Carbonate of soda (crystals)	9 ,,
	Water	80 ,,

Add the acid to the water before dissolving the pyro.

For correct exposure, use equal parts of Nos. 1 and 2.

For under-exposure, use more No. 2.

For over-exposure use more No. 1, or add a few drops of per ounce 10 per cent. bromide potassium solution.

For correct exposure, no bromide is necessary.

Hydroquinone.

No. 1.	Water	20 ounces.
	Hydroquinone	120 grains.
	Sulphite soda	2 ounces.
No. 2.	Water	20 ounces.
	Carbonate of potash	4 ,,
	Bromide potassium	30 grains.

Dissolve the hydroquinone in the water before adding the sulphite. For use take equal parts of each.

Hydroquinone Developer for Lantern Plates.

(For Black Tones.)

Distilled water	20 ounces.
Hydroquinone	60 grains.
Sulphite soda	2 ounces.
Carbonate soda (crystals)	6 ,,
Bromide potassium	40 grains.

Dissolve the hydroquinone in the water and add the other ingredients in the order named.

Time of development, if exposed correctly, about 2 minutes. This developer may be used several times.

Pyro Developer.

(For Warm Tones.)

No. 1.	Water	20 ounces.
	Nitric acid	20 drops.
	Sulphite soda	4 ounces.
	Pyrogallic acid	1 ounce.
No. 2.	Water	20 ounces.
	Bromide ammonium (not potassium)	3 ,,
	Liq. ammonia ·880	1 ounce.

Add the acid to the water, and the other ingredients in the order named.

For use, take 1 part each of Nos. 1 and 2, and dilute with equal quantities of water. For still warmer tones, add 1 part more water, or again double the exposure and add one-fourth more No. 2. This developer may be used several times.

CADETT & NEALL'S FORMULÆ.

Pyro Ammonia (1).

Stock Solution.

Pyrogallic acid	(avoirdupois)	1	ounce.
Ammonium bromide	,,	½	,,
Potass. metabisulphite	,,	1	,,

Distilled water to make altogether, 7 ounces, 3 drachms, fluid.

Dissolve the metabisulphite and bromide in part of the distilled water before adding the pyrogallic acid.

A. Stock solution .... 1 ounce.
Distilled water to make altogether ...... 20 ounces = 1 pint.

B. Ammonia (·890) .... 2½ drachms.
Distilled water to make altogether ...... 20 ounces = 1 pint.

Mix equal parts of A and B to make developer.

Pyro Ammonia (2).

Stock Solution.

Pyrogallic acid	(avoirdupois)	1	ounce.
Ammonium bromide	,,	1	,,
Sulphurous or sulphuric or citric acid		1	drachm.

Distilled water to make altogether, 7 ounces, 3 drachms, fluid.

Mix the acid with part of the distilled water before adding the bromide and pyrogallic acid.

A. Stock solution .... 1 ounce.
Distilled water to make altogether ...... 20 ounces = 1 pint.

B. Liq. ammoniæ (·890) .... 2½ drachms.
Distilled water to make altogether ...... 20 ounces = 1 pint.

Mix equal parts of A and B to make developer.

Ferrous Oxalate.

A. Ferrous sulphate .... (avoirdupois) 5 ounces.
Sulphuric acid.. 10 minims.
Distilled water to make altogether (avoirdupois) 20 ounces.

B. Neutral potass. oxalate .... (avoirdupois) 10 ounces.
Distilled water to make altogether .... (fluid) 40 ,,

Dissolve the potass. oxalate in about three-quarters of the distilled water, made warm, and make up to bulk after the salt is dissolved.

The ferrous sulphate should be powdered just before solution in about three-quarters of the distilled water to which the sulphuric acid has been previously added. Make up to bulk after solution.

To make developer, add one part of A to four of B. For over-exposure, add a few drops to the mixed developer of a ten per cent. solution of potassium bromide.

PYRO SODA.

Stock Solution.

Pyrogallic acid	(avoirdupois)	1	ounce.
Potassium metabisulphite		40	grains.
or sulphuric acid	(fluid)	1	drachm.
Distilled water to make altogether	,,	10	ounces.
A. Stock solution	(fluid)	3	ounces.
Distilled water to make altogether	,,	20	,,
B. Sodium carbonate (crystals)	(avoirdupois)	11	ounces.
or ditto ditto (anhydrous)	,,	4	,,
Sodium sulphite (recrystd.)	,,	15	,,
Distilled water to make altogether	,,	80	,,

Equal parts of each to make developer.

A few drops of a ten per cent. solution of potassium bromide may by added to the developer when necessary. In very hot weather the hypo bath should not be stronger than 1lb. of sodium hyposulphite to 2 quarts of water.

DEVELOPERS FOR THE 'CADETT' LANTERN PLATES.

Warm Tones.—Pyro Ammonia.

A. Pyrogallic acid		40	grains.
Ammonium bromide		40	,,
Potass metabisulphite		120	,,
Distilled water to make altogether	(fluid)	20	ounces.
B. Liq. ammoniæ		150	minims.
Distilled water to make altogether	(fluid)	20	ounces.

Equal parts of A and B to make developer.

This formula gives rich warm tones with suitable exposure.

For warm black tones, the following may be used :—

A.	Pyrogallic acid	30 grains.
	Sodium sulphite	100 ,,
	Sulphurous acid (or citric acid 5 grains)	5 minims.
	Ammonium bromide	30 grains.
	Distilled water to make altogether	20 ounces.
B.	Liq. ammoniæ ·890	40 minims.
	Distilled water to make altogether ...... (fluid)	20 ounces.

Equal parts A and B to make developer.

A rich warm black can be obtained with hydroquinone, and we strongly recommend the following formula :—

A.	Hydroquinone	70 grains.
	{ Potass metabisulphite	10 ,,
	{ or sulphurous acid	15 minims.
	Potassium bromide	35 grains.
	Distilled water to make altogether......... (fluid)	20 ounces.
B.	Potassium hydrate (sticks)	140 grains.
	Sodium sulphite	700 ,,
	Distilled water to make altogether	20 ounces.

Equal parts A and B to make developer.

Black Tones.

Cold, but brilliant black tones are obtained with ferrous oxalate, adding a sufficient quantity of a 10 per cent. solution of potassium bromide to prevent too rapid development.

A.	Ferrous sulphate .... (avoirdupois)	5 ounces.
	Sulphuric acid	10 minims.
	Distilled water to make altogether (avoirdupois)	20 ounces.
B.	Neutral potass oxalate.................. (avoirdupois)	10 ounces.
	Distilled water to make altogether...........(fluid)	40 ,,

Dissolve the potass oxalate in about ¾ of the distilled water, made warm, and make up to bulk after the salt is dissolved.

The ferrous sulphate should be powdered just before solution in about ¾ of the distilled water to which the sulphuric acid has been previously added. Make up to bulk after solution.

To make developer, add 1 part of A to 4 of B. For over-exposure add a few drops to the mixed developer of a 10 per cent. solution of potassium bromide.

EASTMAN COMPANY'S FORMULÆ.

For Bromide Paper.

No. 1.	Oxalate of potash	16	ounces.
	Hot water	48	,,
No. 2.	Proto-sulphate of iron	16	ounces.
	Hot water	32	,,
	Acetic acid (or citric acid, ½ ounce)	½	drachm.
No. 3.	Bromide of potassium	1	drachm.
	Water	10	ounces.

These solutions must be cooled and kept separately, and should be mixed only for immediate use.

To develop, take in a suitable tray, No. 1, six ounces; No. 2, one ounce; No. 3, half drachm. Mix in the order given; use cold. After exposure, soak the paper in water until limp; then immerse in the developer. The image should appear slowly, and should develop up strong, clear, and brilliant. When the shadows are sufficiently black, pour off the developer and flood the plate with the

Clearing Solution.

Acetic acid	1	drachm.
Water	32	ounces.

After fixing, wash thoroughly two hours, and hang up to dry. Use fresh developer for each batch of prints. With a glass-bottomed tray, eight ounces of developer are sufficient for a 25 × 30 print.

For Kodak Films.

No. 1.	Sulphite of soda	6	ounces.
	Hot water	32	,,
	When cold, add—		
	Pyrogallic acid	1	ounce.

No. 2.	Carbonate of soda	3 ounces.
	Carbonate of potash	1 ounce.
	Water	32 ounces.

To develop, take, for normal exposures, one part each of No. 1 and No. 2, together with two parts of water.

Restrainer.

Bromide of potassium	1 ounce.
Water	6 ounces.

If a number of films are fixed together in one tray, they should be put in *face down*, to avoid abrasion of the sensitive surface. It is well to move them about in the fixing bath, from time to time, in order to remove any air bubbles. After fixing, *wash thoroughly;* then immerse for one minute in the

Soaking Solution.

Water	16 ounces.
Glycerine	½ ounce.

Remove from the soaking solution, and pin up each film by *one* of its corners, to dry spontaneously. Any tear drops of the soaking solution should be removed with a bit of blotting-paper or absorbent cotton.

EDWARDS'S FORMULÆ.

PYRO AND AMMONIA DEVELOPER.

No. 1.	Pyrogallic acid	1 ounce or	30 grammes.
	Citric acid	40 grains or	3 ,,
	Water	7½ ounces or	214 c. c.
No. 2.	Strong ammonia ·880	1 ounce or	28 c. c.
	Bromide of potassium	120 grains or	8 grammes.
	Distilled water	7 ounces or	200 c. c.

The above will keep good for months, if well corked.

For use, dilute 1 part No. 1 with 19 parts of water, and in another

bottle 1 part No. 2 with 19 parts of water. The dilute solutions should be made fresh every day.

To develop a correctly exposed plate or film mix equal parts of these two solutions.

PYRO AND SODA DEVELOPER.

No. 1.	Pyrogallic acid	1 ounce or 30 grammes.
	Nitric acid	20 drops or 1 c. c.
	Water	80 ounces or 2 litres 300 c. c.
No. 2.	Sulphite of soda	10 ounces or 300 grammes.
	Carbonate of soda (washing soda)	8 ounces or 226 grammes.
	Water	80 ,, ,, 2 litres 300 c. c.
No. 3.	Bromide of potassium	1 ounce or 30 grammes.
	Water	9 ounces or 250 c. c.

To develop, mix equal parts of Nos. 1 and 2, and add 10 minims of No. 3 to each ounce of the mixed developer, or, instead, 3 ounces of No. 3 may be added to the 80 ounces of No. 2. For rapid shutter exposures, omit the bromide.

PYRO AND SODA DEVELOPER WITH METABISULPHITE.

No. 1.	Pyrogallic acid	1 ounce or 30 grammes.
	Metabisulphite of soda (Boake's)	1 ,, ,, 30 ,,
	Water	80 ounces or 2 litres 300 c. c.

Dissolve the metabisulphite, and then add the pyro.

No. 2.	Carbonate of soda (washing soda)	12 ounces or 360 grammes.
	Sulphite of soda	4 ,, ,, 120 ,,
	Water	80 ,, ,, 2 litres 300 c. c.
No. 3.	Bromide of potassium	1 ounce or 30 grammes.
	Water	9 ounces or 250 c. c.

To develop, mix equal parts of Nos. 1 and 2. When working in the summer time in a good light, with full exposure, add 5 minims of No. 3 to each ounce of developer (or to save the trouble of measuring small quantities, 1½ ounces of No. 3 may be added to the 80 ounces of No. 2). In winter the bromide may generally be omitted, and also for rapid shutter exposures, and portrait work in the studio.

Hydroquinone Developer.

No. 1.	Hydroquinone	¼ ounce or 7 grammes.
	Sulphite of soda	1 " " 30 "
	Bromide of potassium	7 grains or ½ gramme.
	Distilled boiling water to make	12 ounces or 340 c. c.
No. 2.	Carbonate of potash	½ ounce or 15 grammes.
	Distilled water to make	12 ounces or 340 c. c.

First dissolve the hydroquinone, and then add the sulphite and bromide.

For use mix equal parts of Nos. 1 and 2.

In case of slight over-exposure add a few drops or minims of a 10 per cent. solution of bromide of potassium to each ounce of developer, more or less according to the extent of over-exposure. For considerable over-exposure use the redeveloper.

For under-exposure, pour off the hydroquinone developer and finish development with the eikonogen developer given below.

Eikonogen Developer.

Eikonogen	½ ounce or 14 grammes.
Carbonate of potash	1 " " 30 "
Sulphite of soda	2 ounces or 60 "
Distilled boiling water	20 " " 600 c. c.

First dissolve the eikonogen, then the sulphite, and lastly the carbonate of potash.

Instead of mixing the developers, the development may be commenced with eikonogen, and when the detail is sufficiently out, hydroquinone substituted for it, without waiting to wash the negative, and the development finished with this, or in case of much over-exposure with the following hydroquinone redeveloper:—

Hydroquinone Redeveloper.

No. 1.	Hydroquinone	¼ ounce or 7 grammes.
	Sulphite of soda	2 ounces or 60 "
	Bromide of potassium	¼ ounce or 7 "
	Distilled boiling water to make	12 ounces or 340 c. c.

No. 2.	Carbonate of soda (washing soda)	2 ounces or	60 grammes.
	Sulphite of soda	2 ,, ,,	60 ,,
	Distilled water to make	12 ,, ,,	340 c. c.

For use mix equal parts of Nos. 1 and 2.

Edwards's Gelatino-chloride Plates.

Development.

Make two stock solutions as follows:—

No. 1.	Neutral oxalate of potash	2 ounces.
	Chloride of ammonium	40 grains.
	Distilled water	20 ounces.
No. 2.	Sulphate of iron	4 drachms.
	Citric acid	2 ,,
	Alum	2 ,,
	Distilled water	20 ounces.

The above solutions will keep indefinitely.

When required for use, mix equal portions of the above solutions, adding No. 2 to No. 1, to form the developer.

Edwards's Special Transparency Plates.

Pyro and Ammonia Developer.

For Warm Tones.

No. 1.	Pyrogallic acid	1 ounce or	30 grammes.
	Sulphite of soda	4 ounces or	120 ,,
	Citric acid	¼ ounce or	8 ,,
	Water to make	16 ounces or	460 c. c.

First dissolve the sulphite and citric acid, and then add the pyrogallic.

No. 2.	Bromide of ammonium	1 ounce or	30 grammes.
	Liq. ammoniæ ·880	5½ drachms or	20 c. c.
	Water to make	16 ounces or	460 c. c.

For use, mix 1 part of No. 1 and 3 parts of No. 2, and dilute with water to double the quantity.

Hydroquinone Developer.

For Black Tones.

Hydroquinone	60 grains or	3 grammes.
Sulphite of soda	2 ounces or	45 ,,
Carbonate of soda (crystals)	4 ,, ,,	90 ,,
Carbonate of potash	2 ,, ,,	45 ,,
Bromide of potassium	40 grains or	2 ,,
Hot distilled water	20 ounces or	450 c. c.

For black and white line subjects add 1 drachm of a 60-grain solution of bromide of potassium to each ounce of developer.

Dissolve the hydroquinone in the water, and add the other ingredients in the order named.

Amidol Developer.

For Black Tones.

Amidol	80 grains or	5 grammes.
Soda sulphite	2 ounces or	60 ,,
Bromide of potassium	½ ounce or	15 ,,
Water	12 ounces or	360 c. c.

ELLIOTT & SONS' FORMULÆ.

THE 'BARNET' PLATES, ORDINARY.

No. 1.	Ammonia (·880)	1½ ounce.
	Water	20 ounces.
No. 2.	Pyrogallic acid	160 grains.
	Bromide of ammonium	¾ ounce.
	Water	20 ounces.
	Pure nitric acid	10 drops.

For use, mix ½ an ounce of No. 1, ½ an ounce of No, 2 with 3 ounces of water.

Pyro and Ammonia (*ten per cent. Solutions*).

No. 1.	Ammonia (·880)	1 ounce.
	Water	9 ounces.

No. 2.	Bromide of ammonium	1 ounce.
	Water, to make	10 ounces.
No. 3.	Pyro	1 ounce.
	Water, to make	10 ounces.
	Nitric acid, pure	20 drops.

For studio use, take 80 minims No. 1, 40 minims No. 2, 20 minims No. 3, and make up to 2 ounces with water.

The above developer is the same strength as that recommended on the boxes.

For outdoor work, take 80 minims No. 1, 60 minims No. 2, 40 minims No. 3, and make up to 2 ounces with water.

Pyro and Soda Developer.

Solution No. 1.

Pyro	1 ounce.
Water	86 ounces.
Nitric acid, pure	20 drops.

Solution No. 2.

Pure sulphite soda	10 ounces.
Pure carbonate soda (crystals)	9 ,,
Water	86 ,,

Use equal parts of No. 1 and 2, and dilute with equal bulk of water. To each ounce add 1 or 2 drops of a ten per cent. solution of bromide of potassium.

'BARNET' LANTERN TRANSPARENCY PLATES.

For Cold or Warm Tones (according to exposure and development).

INSTRUCTIONS FOR USE.

Contact Printing.—For black tones the exposure required is about 10 seconds at a distance of 1 foot from an ordinary gas flame: the developer to be used is either No. 1 or 2.

To secure warm tones it is necessary to increase the exposure to 2 or 3 minutes and use formula either No. 3 or 4.

To obtain still warmer (reddish) tones, increase the exposure still further to 5 or 6 minutes and develop with formula No 5.

Reductions in the Camera.—For black tones with stop *f*-16 in bright

diffused light from a half-plate negative an exposure of about 10 seconds is required, using formula No 1 or 2 for developing.

For warm tones increase the exposure to 2 or 3 minutes and using for developer either formula No. 3 or 4.

For still warmer tones further increase the exposure to 5 or 6 minutes and develop with formula No. 5.

Formulæ for Developers.

Note.—In cold weather all solutions should be raised to a temperature of 60°.

Cold Black Tones.

A.

No. 1.	Metol	400 grains.
	Soda sulphite	8 ounces.
	Water	80 ,,

B.

Carbonate of potash	1200 grains.
Ammonium bromide	240 ,,
Potassium bromide	480 ,,
Water	80 ounces.

Take equal parts of A and B.

Note.—The ammonium bromide is necessary for the production of absolutely cold black tones; a larger quantity is not recommended, as it tends to produce a slight veil in the high lights.

Length of time in developing about 2 minutes.

Warm Black Tones.

A.

No. 2.	Hydroquinone	640 grains.
	Soda sulphite	8 ounces.
	Potass bromide	120 grains.
	Water	80 ounces.

B.

Sodium hydrate	640 grains.
Water	80 ounces.

Take equal parts of A and B.

This produces a very pleasing warm black. Length of time in developing about 2 minutes.

Warm Brown Tones.

A.

No. 3. Pyro	1	ounce.
Soda sulphite	4	ounces.
Water	80	,,

B.

Carbonate of ammonia	900	grains.
Potassium hydrate	750	,,
Ammonium bromide	600	,,
Water	80	ounces.

Take equal parts of A and B.

Length of time in developing about 2 minutes.

Or the following may be used:—

No. 4.—Take equal parts of No. 2 formula and add to each ounce 3 grains carbonate of ammonia and 3 grains of ammonium bromide.

Length of time in developing about 3 or 4 minutes.

Very Warm (Reddish) Tones.

No. 5.—Take equal parts of No. 2 formula and add to each ounce 6 grains of carbonate of ammonia and 6 grains ammonium bromide.

Length of time in developing about 8 minutes.

Fixing Bath.

We recommend the bath not to be made stronger than

Hypo	5	ounces.
Water	20	,,

Clearing solutions will not be found necessary with these plates.

BARNET BROMIDE PAPER.

(Extra Rapid)

Platino Matt Surface.—Directions for Working.

Exposure.—For contact work from an average negative about 4 seconds, 18 inches from an ordinary gas burner.

For enlarging it is impossible to give any fixed data, so much depending upon the source of light. It is recommended to make a trial exposure upon a small piece of paper.

After exposure place the print, sensitive side upwards, in a clean developing dish, flood with water for a few seconds, drain off water, and then with one sweep cause the developer to flow evenly and quickly over the whole surface of the print.

Developers.—Ferrous-oxalate.

A.	Oxalate of potash	1 pound.
	Bromide potass	5 grains.
	Hot water	48 ounces.
B.	Sulphate of iron	1 pound.
	Citric acid	½ ounce.
	Hot water	32 ounces.

Take 6 ounces of A and 1 ounce of B.

Immediately after developing, the print must be transferred straight into the acid bath.

Acetic acid	1 drachm.
Water	32 ounces.

We strongly recommend the following

Metol Developer.

A.	Metol	400 grains.
	Sodium sulphite	8 ounces.
	Potass bromide	50 grains.
	Water	80 ounces.
B.	Potass carbonate	8 ounces.
	Water	80 ,,

Take 3 ounces of A and 1 ounce of B.

The image should appear in a few seconds, and development will be complete in about 2 minutes. Rinse in 3 changes of water and fix in fixing bath as above (no acid bath is necessary with this developer).

To produce softer results, either of the above may be diluted with an equal quantity of water.

After fixing, wash thoroughly in several changes of water for at least 2 hours, squeegee off the superfluous moisture, and hang up to dry.

GEM DRY PLATE COMPANY'S FORMULÆ.

DEVELOPER FOR PLATES AND FILMS.

No. 1.	Pyrogallic acid	1 ounce.
	Potassium bromide	60 grains.
	Sulphite of soda	6 ounces.
	Water to	50 ,,
No. 2.	Washing soda	6 ounces.
	Water to	50 ,,

For use, take equal quantities of No. 1 and No. 2.
For known under-exposure use an increased proportion of No. 2.
For known over-exposure use larger quantity of No. 1.

Alum Bath.

Alum	1 ounce.
Water	20 ounces.

Wash before and after immersing in the alum bath.

Fixing Solution.

Hypo	1 pound.
Water	64 ounces.

LANTERN PLATES.

Developer for Cold or Warm Tones.

Cold Tones.

Hydroquinone.

A.	Hydroquinone	½ ounce.
	Citric acid	¼ ,,
	Potassium bromide	60 grains.
	Water	20 ounces.
B.	Caustic soda	½ ounce.
	Sodium sulphite	3 ounces.
	Water	20 ,,

For use, take equal parts of A and B, and dilute with water equal to their combined bulk.

Warm Tones.

C.	Ammonium carbonate	1 ounce.
	Ammonium bromide	1 ,,
	Water	20 ounces.

For use, take of the above hydroquinone formula 2 parts, and add 1 part of C.

In obtaining either cold or warm tones, it is well to remember that exposure is the greatest factor. For cold tones, an exposure of 10 to 20 seconds, 1 foot from a No. 5 gas burner, will be ample, and develop as above. For warm and deeply coloured tones, expose from 30 seconds to 3 minutes, and develop with addition of C, always using a slightly increased proportion of C as the exposure is prolonged.

THE ILFORD FORMULÆ.

Stock Solution of Pyro.

Water	5½ ounces.
Nitric acid	20 minims.
Pyrogallic acid	1 ounce.

Add the acid to the water *before* the pyro, and the solution will then keep good for several months.

For Soft Negatives.

No. 1.	Stock solution	1 ounce.
	Water to make up to	20 ounces.

For Dense Negatives.

Stock solution	2 ounces.
Water to make up to	20 ,,

No. 2.	Carbonate of soda, crystals (not bicarbonate) (avoirdupois)	2 ounces.
	Sulphite of soda ,,	2 ,,
	Bromide of potassium	20 grains.
	Water to make up to	20 ounces.

For normal exposures take equal quantities of Nos. 1 and 2.

IMPORTANT.

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Alum Bath.—After developing, wash the plate well under the tap, and immerse for a few minutes in

Alum	3 ounces.
Water	20 ,,

Never omit the alum bath, and do not be tempted to add any other chemical either to that or to the fixing bath.

Ilford Bromide Paper and Opals.

Development.—Make the following solutions and use when cold :—

No. 1.	Neutral oxalate potash (avoirdupois)	1 pound.
	Warm water	64 ounces.
	Bromide ammonium	20 grains.
	Filter.	
No. 2.	Sulphate iron (avoirdupois)	1 pound.
	Warm water	48 ounces.
	Sulphuric acid	1 drachm.
	Filter.	

For use, add 1 ounce No. 2 to 6 ounces No. 1, not *vice versâ.* As for Alpha, old developer gives brilliancy, especially in cases of over-exposure or weak negatives. Development is complete when image appears fully out. After development and without washing, immerse the prints for about 2 minutes in clearing solution, pour off and repeat.

Clearing Solution.

Water	80 ounces.
Sulphuric acid	½ ounce.

Then wash thoroughly for about 10 minutes in several changes of water. All the acid must be removed, or fading of prints will result.

After fixing, wash for 2 hours in running water or in frequent changes. Allow prints to dry naturally. Work with clean hands and clean dishes.

A Universal Developer.

No. 1.	Hydroquinone	160 grains.
	Bromide of potassium	30 ,,
	Sulphite of soda .... (avoirdupois)	2 ounces.
	Water to..	20 ,,
No. 2.	Soda hydrate..	100 grains.
	Water	20 ounces.

Use as follows:—For negatives on Ilford plates: Equal parts Nos. 1 and 2.

For Ilford alpha lantern plates (for warm tone): One part No. 1; half part No. 2; two parts water.

For Ilford bromide papers: One part No. 1 one part No. 2; one part water.

For Ilford special lantern plates (for black tones): Equal parts Nos. 1 and 2.

Although it must be understood that, in our opinion, hydroquinone is somewhat inferior to ferrous oxalate for papers, yet we do not hesitate to put forward this universal developer as an alternative method of working for those who desire simplicity.

NOTE.—The clearing bath must not be used when developing with hydroquinone.

FOR ALPHA PAPER,

For producing Warm Toned Prints by Development.

Make the following solutions, and do not use until cold:—

No. 1.	Oxalate of potash (neutral)	(avoirdupois)	1 pound.
	Bromide of ammonium		320 grains.
	Warm water		64 ounces.

Filter.

No. 2.	Sulphate of iron	(avoirdupois)	$4\frac{1}{2}$ ounces.
	Citric acid	,,	$\frac{1}{2}$ ounce.
	Water	,,	80 ounces.

Filter.

For use, add one part of No. 2 to three parts of No. 1, not *vice versâ.*

THE IMPERIAL COMPANY'S FORMULÆ,

'Imperial Standard' Developer.

No. 1.

Pyrogallic acid	55 grains.
Metol	45 ,,
Metabisulphite of potash	120 ,,
Bromide of potassium	20 ,,
Water (boiled or distilled) to	20 ounces.

No. 2.

Carbonate of soda (washing soda)	4 ounces.
Water (boiled or distilled) to	20 ,,

For use take equal parts of No. 1 and No. 2.

'Imperial Universal' Developer.

No. 1.

Metol	40 grains.
Hydroquinone	50 ,,
Sulphite of soda	120 ,,
Bromide of potassium	15 ,,
Water (boiled or distilled) to	20 ounces.

No. 2.

Caustic potash	180 grains.
Water (boiled or distilled) to	20 ounces.

For use take equal parts of No. 1 and No. 2.

'Imperial Pyro-soda' Developer.

Stock Solution.

Pyrogallic acid	1 ounce.
Bromide of potassium	50 grains.
Metabisulphite of potash	40 ,,
Water (boiled or distilled) to	9 ounces.

No. 1.

Stock solution	3 ounces.
Water (boiled or distilled)	20 ,,

No. 2.

Sulphite of soda	2 ounces.
Carbonate of soda	2 ,,
Water (boiled or distilled) to	20 ,,

For use take equal parts of No. 1 and No. 2.

'IMPERIAL METOL' DEVELOPER.

No. 1.

Metol	100 grains.
Metabisulphite of potash	10 ,,
Bromide of potassium	20 ,,
Water (boiled or distilled) to	20 ounces.

No. 2.

Sulphite of soda	2 ounces.
Carbonate of soda	2 ,,
Water (boiled or distilled) to	20 ,,

For use take equal parts of No. 1 and No. 2.

'IMPERIAL HYDROQUINONE' DEVELOPER.

No. 1.

Hydroquinone	150 grains.
Metabisulphite of potash	10 ,,
Bromide of potassium	50 ,,
Water (boiled or distilled) to	20 ounces.

No. 2.

Sulphite of soda	2 ounces.
Caustic soda	100 grains.
Water (boiled or distilled) to	20 ounces.

For use take equal parts of No. 1 and No. 2.

'Imperial Single-solution' Developer.

Metol	50 grains.
Hydroquinone	40 ,,
Sulphite of soda	500 ,,
Bromide of potassium	25 ,,
Carbonate of soda	500 ,,
Water (boiled or distilled) to	20 ounces.

Imperial 'Special' Lantern Plates.

For producing Transparencies of a Black Tone.

The exposure required for a negative of ordinary density will be about 5 seconds, at a distance of 24 inches from a medium sized gas burner.

Developing formula (hydroquinone) is the same as that used with our ordinary plates.

For development, use 1 part of No. 1 to 1 part of No. 2, and 1 part of water.

Metol developer is also excellent.

After development, the manipulations, washing, &c., will be the same as for negatives.

Imperial 'Slow' Lantern Plates.

For producing Transparencies of a Warm Tone.

The exposure required for a negative of ordinary density will be about 15 seconds, at a distance of 12 inches from a medium size gas burner.

Developing formula (hydroquinone) is the same as that used with 'special' lantern plates.

Imperial Bromide Opals.

Developers.

Metol. A.

No. 1.	Metol	50 grains.
	Dissolve in water	10 ounces
	Then add soda sulphite	1 ounce.
No. 2.	Soda carbonate (washing soda)	2 ounces.
	Water to	10
No. 3.	Potassium bromide	½ ounce.
	Water to	10 ounces.

The developer for normal exposures to consist of 3 parts of No. 1 to 1 part of No. 2, to each ounce of which may, as a rule, be added 20 minims of No. 3.

Oxalate and Iron. B.

No. 1.	Potash oxalate	4 ounces.
	Water	16 ,,
No. 2.	Iron sulphate	3 ounces.
	Water	12 ,,
	Citric acid	50 grains.

Add 1 ounce of No. 2 to 5 ounces of No. 1; and to every ounce of developer add about 10 drops of a ten per cent. solution of potassium bromide.

No. 2 solution must always be added to No. 1 and not *vice versâ.*

MARION'S FORMULÆ

For portraiture the following is recommended:—

PYRO STOCK SOLUTION.

Pyrogallic acid	1 ounce.
Sodium sulphite	4 ounces.
Sulphuric acid	1 drachm.
Water to make up	20 ounces.

SODA STOCK SOLUTION.

Sodium carbonate cryst.	8 ounces.
Sodium sulphite	4 ounces.
Potassium bromide	1 drachm.
Water to make up	20 ounces.

For Development.

Five ounces of each stock solution made up separately to 20 ounces with water and mixed in equal parts at the time of using. When very soft negatives are required—or only a minimum of exposure can be given—the bromide of potassium may be omitted.

PYRO-AMMONIA.

Pyrogallic acid	1 ounce.
Ammonium bromide	1 ,,
Citric acid	1 drachm.
Water to make up	10 ounces.

AMMONIA.

Strongest liquid ammonia ·880	2 ounces.
Water to make up	10 ,,

Two ounces of each of above separately made with water to 20 ounces, form the solutions for use. Equal parts being mixed together at the time of development.

HYDROQUINONE DEVELOPER.

Hydroquinone Solution.

Hydroquinone	40 grains.
Sodium sulphite, pure	120 ,,
Potassium brom.	5 ,,
Citric acid	5 ,,

Water to make up to 10 ounces.

Alkali Solution.

Potass. hydrate, pure	120 grains.

Water to make up to 10 ounces.

This developer, mixed in equal proportions, will contain per ounce Hydroquinone, 2 grains; sulphite, 6 grains; brom., ¼ grain; citric, ¼ grain hydrate, 4 grains.

For Gelatino-chloride Plates.

Iron.

For Cold Tones.

No. 1.	Potass. citrate	100 grains.
	Potass. oxalate	30 „

Hot distilled water to make up to 1 ounce.

For Warm Tones.

No. 2.	Citric acid	90 grains.
	Ammonium carbonate	60 „

Cold distilled water to make up to 1 ounce.

For Extra Warm Tones.

No. 3.	Citric acid	130 grains.
	Ammonium carbonate	40 „

Cold distilled water to make up to 1 ounce.

In mixing the solutions Nos. 2 and 3, it is better to place the crystals of the salts into a deep vessel, and, after adding the water, leave alone till all effervescence ceases. It is advisable to make it over night.

To three parts of either of the above add one part of the following at the time of using :—

Sulphate of iron	120 grains.
Sulphuric acid	1 drop.

Make up with distilled water to 1 ounce.

Either of these developers should give clear glass in the unexposed parts of the picture; but, if at any time the slightest fog is found, it should at once be cured by the addition of a trace of either potassium bromide or sodium chloride. Bromide is better with No. 1, and chloride with either No. 2 or No. 3. A convenient form of using these will be to keep a ten per cent. solution of each of these salts, and one or two minims to each ounce of developer will be found a powerful restrainer.

Hydroquinone.

No. 1.	Hydroquinone	48 grains.
	Sodium sulphite	320 „
	Ammonium bromide	2 „

Water to make up to 10 ounces.

No. 2.	Ammonium carbonate	100 grains.
	Sodium carbonate	100 „

Water to make up to 10 ounces.

Equal proportions of each are mixed together, according to size of plate to be developed at the time of using.

Different alkalies may be substituted for those mentioned, such as potassium carbonate, sodium silicate, potassium hydrate, sodium hydrate, &c.; but, in all cases, a small proportion of bromide should be used.

A number of plates may be developed one after the other in the same solution.

Eikonogen.

This developing agent, first introduced by us, will be found to give admirable results of a pleasing colour.

Formula.

Sulphite soda, pure	200 grains.
Eikonogen	50 ,,
Potassium bromide	5 ,,
Water to make up to	10 ounces.
Sodium carbonate	160 grains.
Water to make up to	10 ounces.

Equal parts to be mixed together at time of using.

For Chloro-bromide Plates.

Pyrogallic Development.

A. Pyrogallic acid	40 grains.
Pure sodium sulphite	16 ,,
Citric acid	5 ,,
Water	10 ounces.
B. Liq. am. fort.	40 minims.
Potassium bromide	40 grains.
Water to make up to	10 ounces.

Equal parts of the solutions to be mixed at the time of using.

A very pleasing warm colour will be obtained by adding to the B solution 200 grains of ammonium carbonate, but the time of development will be increased.

Ferrous-oxalate Development.

The saturated solutions of potassic oxalate and iron sulphate may be used in the proportion of three or four parts of the former to one of the latter, with the addition of one grain of potassium bromide to each ounce of developer, adding more bromide and increasing the amount of exposure when warmer tones are required.

To keep the iron solution from oxidising, one drop of sulphuric acid should be added to each ounce of water before dissolving the salt.

The ferrous-oxalate gives a blacker coloured image than pyrogallic developer.

The time of development will vary from two to four minutes, according to temperature and density of image required.

Hydroquinone Developer.

Hydroquinone Solution.

Hydroquinone	40 grains.
Sodium sulphite, pure	120 ,,
Potassium bromide	5 ,,
Citric acid	5 ,,
Water to make up to	10 ounces.

Alkali Solution.

Potassium hydrate, pure	80 grains.
Water to make up to	10 ounces.

Equal parts to be mixed together at time of using.

It is advisable that all solutions should be made with distilled water, though not absolutely essential.

Several plates may be developed in the same solution.

EIKONOGEN DEVELOPER.

This developer will be found to suit these equally well with slight modification.

A small proportion of bromide must be used to ensure absolute clearness in the unexposed parts.

Formula.

Sodium sulphite	400 grains.
Potassium bromide	5 ,,
Eikonogen	100 ,,
Water to make up to	10 ounces.
Sodium carbonate	320 grains.
Water to make up to	10 ounces.

Equal parts of each to be mixed together at time of using.

FOR ARGENTIC BROMIDE OPALS.

Formula for Amidol Developers.

Amidol	20 grains.
Sodium sulphite	200 ,,
Potassium bromide	20 ,,

Made up to 10 ounces with water.

Form the developer in one solution ready for use. Plates developed with this formula will not require the acid bath previous to fixing.

Formula for Eikonogen Developer.

Eikonogen	40 grains.
Sodium sulphite	160 ,,
Lithium carbonate	2 ,,
Water to make up to	10 ounces.

This will keep for a considerable time if well corked.

One drop of a ten per cent. solution of potassium bromide may be added to each ounce of developer.

Plates developed with eikonogen will not require the acid bath previous to fixing.

MAWSON & SWAN'S FORMULÆ.

The 'Mawson' or 'Castle' Plate.

Developers.

Pyro-ammonia Developer.

Stock Solution (ten per cent.).

Pyrogallic acid	480 grains.
Bromide of ammonium	240 ,,
*Metabisulphite of potassium	480 ,,
Distilled water to make up ....(fluid)	10 ounces.

Dissolve the metabisulphite in part of the water, then add the other ingredients, and make up to bulk with water.

A. Stock solution	300 minims.
Distilled water to make up to ....(fluid)	10 ounces.
B. Liq. ammonia ·880	70 minims.
Distilled water to make up to ....(fluid)	10 ounces.

Use equal parts of A and B mixed at time of developing.

Pyro-soda Developer.

	Pyrogallic acid	60 grains.
	*Metabisulphite of potassium	15 ,,
	Distilled water to make up to (fluid)	10 ounces.
B.	Washing soda	600 grains.
	Sulphite of soda	800 ,,
	Distilled water to make up to (fluid)	10 ounces

Use equal parts of A and B mixed at time of developing.

To correct errors in exposure :—If under-exposed, use a larger proportion of B ; if over-exposed, decrease the proportion of B, and add a few drops of a 10 per cent. solution of bromide of potassium.

* Metabisulphite of potassium is unequalled as a preservative of pyrogallic acid in solution. If not at hand, substitute for each grain of metabisulphite, sulphuric acid ½ minim *plus* sulphite of soda, 2½ grains.

Eikonogen Developer.

A.	Eikonogen	100 grains.
	Sulphite of soda (recrystd.)	100 ,,
	Distilled water to make up to (fluid)	10 ounces.
B.	Carbonate of potassium (com.)	1200 grains.
	Sulphite of soda (recrystd.)	500 ,,
	Distilled water to make up to (fluid)	10 ounces.

Use 3 parts of A to 1 part of B, mixed at time of devoloping.

Hydroquinone Developer.

A.	Hydroquinone	40 grains.
	Metabisulphite of potassium	40 ,,
	Bromide of potassium	5 ,,
	Distilled water to make up to (fluid)	10 ounces.
B.	Caustic potass (sticks)	80 grains.
	Distilled water to make up to (fluid)	10 ounces.

Use equal parts of A and B mixed at time of developing.

THE 'MAWSON' PHOTO-MECHANICAL PLATE.

DEVELOPERS.

Pyro-ammonia Developer.

A.	Pyrogallic acid	30 grains.
	Bromide of ammonium	30 ,,
	Metabisulphite of potassium	30 ,,
	Distilled water to make up to (fluid)	10 ounces.
B.	Liq. ammoniæ ·880	70 minims.
	Distilled water to make up to (fluid)	10 ounces.

Use equal parts of A and B mixed at time of developing.

Hydroquinone Developer.

A	Hydroquinone	40 grains.
	Bromide of potassium	10 ,,
	Metabisulphite of potassium	40 ,,
	Distilled water to make up to (fluid)	10 ounces.
B.	Caustic potass (sticks)	80 grains.
	Distilled water to make up to (fluid)	10 ounces.

Use equal parts of A and B mixed at time of developing.

THE 'MAWSON LANTERN' PLATE.

Developers.

Exposure.—A negative of average density requires about 15 seconds at 1 foot from a No. 6 batswing burner. Short exposure tends to produce black tones; long exposure, brown tones.

Either of the following developers may be used, though we give the preference to the pyro-ammonia, greater variety of tone being available by it.

Development begins rather slowly, especially with the hydroquinone formula, afterwards proceeding more rapidly.

Pyro-ammonia Developer.

A.	Pyrogallic acid	20 grains.
	Bromide of ammonia	20 ,,
	Metabisulphite of potassium	50 ,,
	Distilled water to make up to (fluid)	10 ounces.

B. Liq. ammoniæ ·880		70 minims.
Distilled water to make up to	(fluid)	10 ounces.

Use equal parts of A and B mixed at time of developing.

Hydroquinone Developer.

A. Hydroquinone		40 grains.
Bromide of potassium		40 ,,
Metabisulphite of potassium		40 ,,
Distilled water to make up to	(fluid)	10 ounces.
B. Caustic potass (sticks)		80 grains.
Distilled water to make up to	(fluid)	10 ounces.

Use equal parts of A and B mixed at time of developing.

Eikonogen Developer.

A. Eikonogen		100 grains.
Bromide of potassium		20 ,,
Sulphite of sodium (recrystd.)		100 ,,
Distilled water to make up to	(fluid)	10 ounces.
B. Washing soda		600 grains.
Distilled water to make up to	(fluid)	10 ounces.

Use equal parts of A and B mixed at time of developing.

Ferrous-oxalate Developer.

A. Neutral oxalate of potassium		1200 grains.
Bromide of potassium		5 ,,
Citric acid		15 ,,
Distilled water to make up to	(fluid)	10 ounces.
*B. Ferrous sulphate		1600 grains.
Citric acid		120 ,,
Distilled water to make up to	(fluid)	10 ounces.

Use 7 parts of A and 1 part of B, mixed at time of developing.

* Should this solution after keeping change to a brown colour, discard and mix afresh.

THE MAWSON OPAL PLATE.

Developer.

A.	Neutral oxalate of potassium	1200 grains.
	Bromide of potassium	5 ,,
	Citric acid	15 ,,
	Distilled water to make up to .... (fluid)	10 ounces.
B.	Ferrous sulphate	1600 grains.
	Citric acid	120 ,,
	Distilled water to make up to .... (fluid)	10 ounces.

Use 7 parts of A and 1 part of B, mixed at the time of developing. Should B, after keeping, change to a brown colour, discard and mix afresh.

THE MAWSON BROMIDE PAPER.

Developer.

A.	Neutral oxalate of potassium	1200 grains.
	Bromide of potassium	5 ,,
	Citric acid..	15 ,,
	Distilled water to make up to .... (fluid)	10 ounces.
B.	Ferrous sulphate	1600 grains.
	Citric acid	120 ,,
	Distilled water to make up to .... (fluid)	10 ounces.

Use 7 parts of A and 1 part of B, mixed at the time of developing. Should B, after keeping, change to a brown colour, discard and mix afresh.

THE PAGET PRIZE PLATE COMPANY'S FORMULÆ.

PYRO AMMONIA.

No. 1.	Pyrogallic acid..	1 ounce.
	Citric acid	60 grains.
	Sodium sulphite (pure)	2½ ounces.
	Distilled water to make	20 ,,

No. 2.	Liq. ammoniæ ·880	1	ounce.
	Ammonium bromide	80	grains.
	(For Phœnix plates, 120 grains.)		
	Distilled water to make	20	ounces,

One part of each to 10 parts of water.

PYRO SODA.

No. 1.	Pyrogallic acid	½	ounce.
	Sulphuric acid	5	drops.
	Distilled water to make	20	ounces.
No. 2.	Carbonate of soda (cryst. pure)	2	ounces.
	Sulphite of soda (pure)	2	„
	Distilled water to make	20	„

Equal parts of each.

HYDROQUINONE.

No. 1.	Hydroquinone	1	ounce.
	Methylated spirit	10	ounces.
	Sulphurous acid	½	ounce.
	Potassium bromide	¼	„

Dissolve the hydroquinone in the spirit, and add the acid. In another vessel dissolve the potassium bromide in 3 ounces of distilled water, Mix the two solutions, and make up to 20 ounces with distilled water,

No 2.	Caustic soda (in sticks)	1	ounce.
	Sodium sulphite	5	ounces.
	Distilled water to make	20	„

One part of each to 4 parts of water.

If this be found to give too hard a negative, use more water.

EIKONOGEN.

No. 1.	Eikonogen	½	ounce.
	Sodium sulphite	1½	„
	Potassium bromide	8	grains.
	Distilled water to make	30	ounces.

Sixty grains hydroquinone added to above is a decided improvement, increasing brilliancy and density.

No. 2.	Potassium carbonate	1 ounce.
	Distilled water to make	10 ounces.

Three parts of No. 1 to one part of No. 2.

DEVELOPMENT.

For BLACK TONES any of the following formulæ are suitable :—

Pyro Ammonia.

Solution No. 1.

Pyrogallic acid	1 ounce.
Sodium sulphite	1½ ,,
Citric acid	¼ ,,
Distilled water to	10 ounces.

Solution No. 2.

Liquor ammoniæ, ·880	1 ounce.
Ammonium bromide	1 ,,
Distilled water to	10 ounces.

For use, take 45 minims of each solution and make up with water to 2 ounces.

Ferrous-oxalate Developer.

Solution No. 1.

Neutral oxalate of potash	16 ounces.
Citric acid	60 grains.
Hot water	50 ounces.

Solution No. 2.

Proto-sulphate of iron	4 ounces.
Citric acid	15 grains.
Hot water	8 ounces.

Solution No. 3.

Bromide of potassium	½ ounce.
Water	10 ounces.

For development, take 6 ounces of No. 1 and add 1 ounce of No. 2 and 24 drops of No. 3. Gives cold black tones.

Eikonogen Developer.

Solution No. 1.

Eikonogen	½ ounce.
Sodium sulphite	1½ „
Potassium bromide..	8 grains.
Distilled water to	30 ounces.

Solution No. 2.

Potassium carbonate	1 ounce.
Distilled water to	10 ounces.

Take three parts of No. 1 to one part of No. 2 solution.

Rodinal Developer.

Rodinal concentrated solution	1 part.
Water	30 parts.

This is a very clean developer, and gives a rich black colour.

Hydroquinone.

Solution No. 1.

Hydroquinone	½ ounce.
Sulphurous acid	½ „
Potassium bromide..	60 grains.
Water to	20 ounces.

Solution No. 2.

Caustic soda	½ ounce.
Sodium sulphite..	2½ ounces.
Water to	20 „

For use, take ½ ounce of each to 1 ounce of water.

Warm Tones.—Developer.

Solution No. 1.

Hydroquinone	½ ounce.
Sulphurous acid	½ „
Potassium bromide..	60 grains.
Water to	20 ounces.

Solution No. 2.

Caustic soda	½ ounce.
Sodium sulphite	2½ ounces.
Water to	20 ,,

Solution No. 3.

Bromide of ammonium	1 ounce.
Carbonate of ammonium	1 ,,
Water to	20 ounces.

Brown.

Exposure: 60 seconds 1 foot from gas-flame, or 2 inches of magnesium wire burnt at a distance of 3 feet. Developer: solution 1, ½ ounce; solution 2, ½ ounce; solution 3, 100 minims; water to 2 ounces. Time required in development, about 5 minutes.

Purple-brown.

Exposure: 90 seconds 1 foot from gas-flame, or 3 inches of magnesium wire burnt at a distance of 3 feet. Developer: solution 1, ½ ounce; solution 2, ½ ounce; solution 3, 200 minims; water to 2 ounces. Time required in development, about 10 minutes.

Purple.

Exposure: 3 minutes 1 foot from gas-flame, or 3 inches of magnesium wire burnt at a distance of 2 feet. Developer: solution 1, ½ ounce; solution 2, ½ ounce: solution 3, 250 minims; water to 2 ounces. Time required in development, about 12 minutes.

Red.

Exposure: 5 minutes 1 foot from gas-flame, or 5 inches of magnesium wire burnt at a distance of 2 feet. Developer: solution 1, ½ ounce; solution 2, ½ ounce; solution 3, 300 minims; water to 2 ounces. Time required in development, about 15 minutes.

PRINTING-OUT OPALS AND LANTERN PLATES.

Combined Toning and Fixing Bath.

No. 1 Stock.

Hyposulphite of soda	20 ounces.
Alum (potash alum only)	5 ,,
Sodium sulphate (not sulphite)	14 ,,
Water to	1 gallon.

Dissolve the hypo and alum each in about one quart of hot water, mix, and then add sodium sulphate already dissolved, making up to one gallon with remainder of water. This mixture should then be left for some hours for the precipitate to settle, when the clear solution may be poured off or filtered, and is then ready for use. It will keep indefinitely.

No. 2 Stock.

Gold chloride	15 grains.
Acetate of lead	64 ,,
Water (distilled)	8 ounces.

Dissolve the acetate of lead in the water, and add the gold. A heavy precipitate forms in this solution, which should be shaken up when any is to be poured out: it redissolves when added to No. 1 stock solution. For use: Mix 8 oz. of No. 1 with 1 oz. of No. 2. When this bath is used, the prints should *not* be washed *before* toning.

Separate Toning Bath.

Sulphocyanide of ammonium	30 grains.
Gold chloride	2½ ,,
Water	16 ounces.

BROMIDE OPALS.

Development.

For black tones the following developer is the one chiefly used.—

Ferrous-oxalate Developer.

Solution 1.

Neutral oxalate of potash	16 ounces.
Citric acid	60 grains.
Hot water	50 ounces.

Solution 2.

Protosulphate of iron	4 ounces.
Citric acid	¼ ounce.
(Or acetic acid, ½ drachm.)	
Hot water	8 ounces.

Solution 3.

Bromide of potassium	¼ ounce.
Water	10 ounces.

For development take (when cold) 6 ounces of No. 1, and add 1 ounce of No. 2 and ½ drachm of No. 3.

For warm black tones use the hydroquinone developer, made up as follows :—

Hydroquinone Developer.

Solution 1.

Hydroquinone	½ ounce.
Sulphurous acid	¼ ,,
Potassium bromide	60 grains.
Water to	50 ounces.

Solution 2.

Caustic soda	½ ounce.
Sodium sulphite	2½ ounces.
Water to	50 ,,

For use take equal parts of the two solutions. By increasing the exposure and using less of No. 1 Solution, still browner images can be obtained. Other developers, such as eikonogen, pyro, rodinal, &c., can also be used.

ROUCH'S FORMULÆ.

A.	Pyrogallic acid	1 ounce.
	Sulphite of soda	4 ounces.
	Water, to make	10 ,,

Dissolve the sulphite of soda in hot water, and, when cold, add the pyrogallic acid. Should any portion of the sulphite refuse to dissolve, the crystals may be allowed to remain in the bottle.

B.	Bromide of ammonium	1 ounce.
	Water, to make	10 ounces.
C.	Strongest liquor ammoniæ	3 ounces.
	Water, to make	10 ,,

In case sulphite of soda be not readily obtainable, the following may be substituted for solution A as above, and used in the same manner:—

Pyrogallic acid	1 ounce.
Citric acid	50 grains.
Water, to make	10 ounces.

Dissolve the citric acid first, and then add the pyro.

THE SANDELL WORKS COMPANY'S FORMULÆ.

A. Pyro Potash.

No. 1.	Pyro	1 ounce	or	28· grammes.
	Sulphite soda	3 ounces	,,	85· ,,
	Bromide potassium	¾ ,,	,,	21· ,,
	Citric acid	60 grains	,,	4· ,,
	Boiled or distilled water to	10 ounces	,,	300· c. c.
No. 2.	Carbonate potash	2 ounces	,,	56· grammes.
	Sulphite soda	2 ,,	,,	85· ,,
	Boiled or distilled water to	10 ,,	,,	300· ,,

B. Hydroquinone Metol.

No. 1.	Hydroquinone	200 grains	or	13· grammes.
	Metol	20 ,,	,,	1·5 ,,
	Sulphite soda	3 ounces	,,	85· ,,
	Bromide potassium	30 grains	,,	2· ,,
	Citric acid	30 ,,	,,	2· ,,
	Boiled or distilled water to	20 ounces	,,	600· ,,

No. 2. Carbonate soda crystals	2 ounces	,,	56·	grammes.
Caustic soda	60 grains	,,	4·	,,
Boiled or distilled water to.......	20 ounces	,,	600·	c. c.

C. METOL.

No. 1. Metol ....120 grains		or	8·	grammes.
Sulphite soda	2 ounces	,,	56·	,,
Bromide potassium ....129 grains		,,	8·	,,
Boiled or distilled water to......	20 ounces	,,	600·	c. c.
No. 2. Carbonate soda crystals	2 ounces	,,	56·	grammes.
Boiled or distilled water to......	20 ,,	,,	600·	c. c.

D. PYRO AMMONIA.

No. 1. Pyro	1 ounce	or	28·	grammes.
Sulphite soda	3 ounces	,,	85·	,,
Bromide ammonium	1 ounce	,,	28·	,,
Citric acid ....120 grains		,,	8·	,,
Boiled or distilled water to ...	10 ounces	,,	300·	c. c.
No. 2. Liquid ammonia, ·880	1 ounce	,,	30·	c. c.
Boiled or distilled water.........	10 ounces	,,	300·	,,
No. 3. Bromide ammonium	1 ounce	,,	30·	grammes.
Boiled or distilled water.........	10 ounces	,,	300	c. c.

THOMAS'S FORMULÆ.

PYROGALLIC ACID AND AMMONIA.

Stock Solutions.

No. 1. Pyrogallic acid..	1 ounce.
Sodium sulphite	3 ounces.
Potassium bromide..	½ ounce.
Citric acid	¼ ,,
Distilled or boiled water to make.................	10 ounces.

No. 2.	Liq. ammonia ·880	1 ounce.
	Distilled or boiled water to make	10 ounces.

To make 1 ounce of developer, take 20 minims of No. 1 solution and 10 minims of No. 2 solution, and dilute with water to 1 ounce. When detail is out, add 10 minims more of No. 2 to increase density.

This formula represents 2 grains of pyro, 1 grain of potassium bromide, and 1 minim of liq. ammonia ·880 per ounce of developer. In case of under-exposure, these plates will bear the further addition of 1 minim of liq. ammonia ·880 (= 10 minims of No. 2 solution) without fogging.

Pyrogallic Acid and Soda.

Stock Solutions.

No. 1.	Pyrogallic acid	1 ounce.
	Sodium sulphite	4 ounces.
	Citric acid	¼ ounce.
	Potassium bromide	¼ ,,
	Distilled or boiled water to make	20 ounces.
No. 2.	Carbonate of soda (washing soda)	6 ounces.
	or boiled water to make	20 ,,

To make 1 ounce of developer, take 1 drachm of each solution and 6 drachms of water.

Over-exposure requires less of No. 2, and under-exposure more.

This formula represents 3 grains of pyro and 18 grains of carbonate of soda in each ounce of developer.

Metol Developer.

No. 1.	Metol	100 grains.
	Sodium sulphite	2 ounces.
	Distilled or boiled water to make	20 ,,
No 2.	Carbonate of potash	¾ ounce.
	Carbonate of soda, crystals (washing soda) ...	1 ,,
	Potassium bromide	40 grains.
	Distilled or boiled water to make	20 ounces.

For normal exposure take equal parts of each solution.
For over-exposure take less of No. 2.

Hydroquinone-soda Developer.

No. 1.	Hydroquinone	160 grains.
	Sodium sulphite	2 ounces.
	Citric acid	60 grains.
	Potassium bromide	40 ,,
	Distilled or boiled water to make	20 ounces.
No. 2.	Sodium hydrate	160 grains.
	Distilled or boiled water to make	20 ounces.

Take equal quantities of each solution, mixed with the same quantity of water.

In hot weather 3 or 4 grains of potassium bromide may be added to each ounce of diluted developer.

An addition of 2 or 3 grains of potassium bromide to each ounce of developer will always give a clearer and more brilliant image.

Transparency Developers.

Hydroquinone.

No. 1.	Hydroquinone	160 grains.
	Sodium sulphite	2 ounces.
	Citric acid	60 grains.
	Potassium bromide	40 ,,
	Water to	20 ounces.
No. 2.	Sodium hydrate	160 grains.
	Water to	20 ounces.
No. 3.	Bromide ammonium	2 ounces.
	Water to	20 ,,
No. 4.	Carbonate ammonium	2 ounces.
	Water to	20 ,,

Pyrogallic Acid.

No. 1.	Pyrogallic acid	1 ounce.
	Sulphite soda	3 ounces.
	Citric acid	¼ ounce.
	Water to	10 ounces.

No. 2.	Liq. ammonia ·880	1 ounce.
	Water to	10 ounces.
No. 3.	Bromide ammonium	1 ounce.
	Water to	10 ounces.
No. 4.	Carbonate ammonia	1 ounce.
	Water to	10 ounces.

Exposures and development formulæ with approximate time required for development at temperature of 60 degrees.

Black Tone.

Hydroquinone.

Exposure, 1 in. Mg., Distance 3 feet.

Developer	No. 1	½ ounce.
,,	No. 2	½ ,,
Water to		2 ounces.

Time, about 2 minutes.

Pyro.

Exposure, same as with Hydro.

Developer	No. 1	30 minims.
,,	No. 2.	30 ,,
,,	No. 3.	30 ,,
Water to		2 ounces.

Time, about 2 minutes.

Brown Tone.

Hydroquinone.

Exposure, 2 in. Mg., Distance 1 foot.

Developer No. 1.	....	½ ounce.
,, No. 2.	....	½ ,,
,, No. 3.	....	15 minims.
,, No. 4.	....	15 ,,
Water to	....	2 ounces.

Time, about 7 minutes.

Pyro.

Exposure, same as with Hydro.

Developer No. 1.	....	30 minims.
,, No. 2.	....	30 ,,
,, No. 3.	....	45 ,,
,, No. 4.	....	45 ,,
Water to	....	2 ounces.

Time, about 7 minutes.

Purple Tone.

Hydroquinone.

Exposure, 3 in. Mg., Distance 1 foot.

Developer No. 1.	½	ounce.
,, No. 2.	½	,,
,, No. 3.	30	minims.
,, No. 4.	30	,,
Water to	2	ounces.

Time, about 10 minutes.

Pyro.

Exposure, same as with Hydro.

Developer No. 1.	30	minims.
,, No. 2.	30	,,
,, No. 3.	120	,,
,, No. 4.	120	,,
Water to	2	ounces.

Time, about 10 minutes.

Red Tone.

Hydroquinone.

Exposure, 6 in. Mg., Distance 1 foot.

Developer No. 1.	½ ounce.
,, No. 2.	½ ,,
,, No. 3.	90 minims.
,, No. 4.	90 ,,
Water to	2 ounces.

Time, about 15 minutes.

N.B.—For the warm tones, development must be carried much beyond what is apparently sufficient, so much is lost in fixing. A yellow light is recommended to be used, as it greatly facilitates judging of tone. It should also be mentioned that richness of tone is entirely dependent on depth to which development is carried.

Fixing Bath.

We recommend the following as giving great immunity from stain :—

Hypo	5 ounces.
Sulphite of soda	1 ounce.
Water	20 ounces
Dissolve and add sulphuric acid	1 drachm.

WRATTEN & WAINWRIGHT'S FORMULÆ.

I.—Pyrogallic Acid.

Stock Solution A.

Liquor ammoniæ, s.g. ·880	1	ounce.
Potassium bromide	60	grains.
Water	2	ounces.

*Stock Solution B.**

Pyrogallic acid	1	ounce.
Citric acid or sulphurous acid	½	drachm.
Water	10	ounces.

* For the 'Ordinary' plates, B should contain only half the quantity of pyrogallic acid.

Stock Solution C.

Potassium bromide	20	grains.
Water	1	ounce.

Stock Solution D.

Liquor ammoniæ, s. g. ·880	1	drachm.
Water	1	ounce.

II.—For Drop Shutter Special Plates.

Stock Solution B.

Pyrogallic acid	1 ounce.
Citric acid or sulphurous acid	½ drachm.
Water	10 ounces.

Stock Solution A.

Liquor ammoniæ, ·880	1 ounce.
Bromide potassium	100 or 120 grains.
Water	2 ounces.

Soda Developer.

No. 1.	Sulphite of soda	6 ounces.
	Water	80 ,,
	Sulphuric acid (pure)	1 drachm.
	Pyro	1 ounce.
No. 2.	Carbonate of soda	6 ounces.
	Water	80 ,,

Mix in equal parts for correct exposures.

THE GELATINO-CHLORIDE PROCESS.

BARKER'S FORMULA FOR PRINTING-OUT EMULSION.

Gelatine (Nelson's No. 1 and Coignet's, equal parts)	175 grains.
Chloride of ammonium	18 ,,
Rochelle salts..	50 ,,
Nitrate of silver	75 ,,
Alcohol	4 drachms.
Water	5 ounces.

Heat to 100° Fahr., and allow to remain at this temperature after all is dissolved for ten minutes, after which proceed in the usual way.

Toning Baths for the Foregoing.

Wash the prints in clean water and then *tone* in the following:—

1. A. Distilled water	25 ounces.
Acetate of soda (recrystallised)	1 ounce.
Into which pour a solution of 1 per cent. of chloride of gold....................................	2 ounces.

B. In ten ounces of distilled water, dissolve two drachms of sulphocyanide of ammonium, and add one ounce solution of 1 per cent. chloride of gold.

For toning, mix in the proportion of twenty ounces of A to six of B, if possible the evening before using.

ANOTHER.

2. A.	Water	3 ounces.
	Chloride of gold	2 grains.
B.	Water	3 ounces.
	Sulphocyanide of ammonium	40 grains.
	Hyposulphite of soda	1 grain.
	Carbonate of soda	3 grains.

These are mixed together by one part of A being poured into an equal part of B; in no case the reverse.

SOLIO COMBINED TONING AND FIXING BATH.

No. 1.

Hypo	20 ounces.
Alum	5 ,,
Soda sulphate	10 ,,
Potash sulphate	2 ,,
Water	160 ,,

No. 2.

Gold chloride	15 grains.
Lead acetate	64 ,,
Water	8 ounces.

For use, eight ounces of No. 1 solution; one ounce of No. 2.

A red precipitate is thrown down in the gold solution, but, if shaken before addition to the hypo, it will be redissolved.

Formula for Blue Tones.

No. 1.

Borax	600 grains.
Water	160 ounces.

No. 2.

Gold chloride	15 grains.
Water	15 ounces.

For use, eight ounces of No. 1; half ounce of No. 2. The solutions must be kept separate.

A COMBINED TONING AND FIXING BATH.

Water	20 ounces.
Hypo	5 ,,
Citric acid	60 grains.
Acetate of lead	60 ,,
Sulphocyanide of ammonium	240 ,,

These are added, and dissolved in the order given, and the solution allowed to stand for twenty-four hours. A precipitate will then be thrown down, and the clear solution decanted off. Then add—

Chloride of gold	3 grains.

ILFORD PRINTING-OUT PAPER.

Working Instructions.

Printing.—This should be done in shade by preference, unless negatives are specially strong in contrast. The image loses very little depth in toning, &c.

First washing.—For 15 minutes in several changes.

Toning.—For simplicity and excellence of results we recommend the following :—

Water	16 ounces.
Sulphocyanide of ammonium	30 grains.
Chloride of gold..................................	2 ,,

The prints tone in this bath in about 6 minutes, and it should be borne in mind that prints dry somewhat darker and much colder than they appear when wet. The bath should not be used many times; indeed, it is well to make a stock sulphocyanide solution in bulk, and take as much of it as is needed, adding the gold as wanted. A bath with double quantity of water tends to warm tones.

Second washing.—For 5 minutes in several changes.

Fixing.—Use new solution for each batch of prints. The following is best strength :—

Hypo	3 ounces.
Water	20 ,,

Fixation is complete in about 10 minutes.

Final washing.—For at least 2 hours in running water, or many changes

Drying.—Lay the prints face upwards on the blotting paper (or hang up by clips), and allow to dry naturally. Mount with starch paste in usual way.

Alum bath.—If weather is hot, and the surface of the prints becomes soft, immerse for 10 minutes in alum bath (water, 20 ounces; alum, 2 ounces), after the first washing, and before toning, then wash for 10 minutes before putting into toning bath.

Special notes.—Do not use any excess of sulphocyanide over quantity mentioned.

Use the washing water and all solutions as cold as possible.

Keep the prints moving whilst in the various solutions.

Above remarks apply to both varieties of P.O.P., matt and glossy.

IMPERIAL P.O.P.

Directions for Use.

Hard negatives should be printed in strong light, delicate negatives only in the shade.

Prints should be rather darker than the finished picture is desired.

We specially recommend the following bath and mode of procedure for excellence and uniformity of result.

After printing, wash thoroughly for ten to fifteen minutes in running water before immersion in the Toning Solution.

In hot weather, if the surface of the prints become soft, immerse after washing, in an alum bath (alum 1 ounce, water 10 ounces), leave for ten

minutes, wash again in running water for five to ten minutes and place in the following toning bath.

Sulphocyanide Toning Bath.

Stock Gold Solution.

	Chloride of gold	15 grains.
	Water (distilled or boiled) to........................	15 drachms.
No. 1.	Sulphocyanide of ammonium	75 grains.
	Water (boiled or distilled) to	20 ounces.
No. 2.	Stock gold solution..	5 drachms.
	Water to	20 ounces.

For use, take equal quantities of No. 1 and No. 2.

Add solution No. 2 slowly to solution No. 1, stirring all the time. Make up the solutions exactly as above, and follow out the instructions carefully.

The prints should tone in five to ten minutes.

When toning has been judged sufficient, wash for about five minutes and transfer to the following fixing bath :—

Hyposulphite of soda	3 ounces.
Water to	20 ,,

After fixation is complete (about ten minutes), wash thoroughly for one hour.

THE SYLVIO PAPER.

WELLINGTON & WARD, ELSTREE, HERTS.

The phosphate toning bath is recommended :—

Phosphate of soda	40 grains.
Gold chloride	2 ,,
Water	16 ounces.

The bath should be used as soon as it is mixed.

PAGET PRIZE GELATINO-CHLORIDE PRINTING-OUT PAPER.

ORDINARY OR MATT SURFACE.

Printing should be somewhat darker than the finished print is required.

It should be borne in mind, when toning, that the finished image will be bluer and slightly stronger when dry than in the wet state.

Toning.—The following bath is strongly recommended in preference to any other :—

Sulphocyanide of ammonia	30 grains.
Gold chloride	2½ ,,
Water	16 ounces.

Before immersion in this toning bath, the prints should be *very thoroughly washed* for at least fifteen minutes in running water. This is necessary to ensure even toning.

If the toning bath be found to tone too quickly, sulphite of soda equal in quantity to the gold used (*i.e.*, 2½ grains for above quantity) may be added. This will make the bath work more slowly, without making any other difference. More or less may be used so as to regulate to speed desired. The sulphite should be kept in a stock solution and added to the bath immediately before use.

In hot weather, if necessary, the print may be soaked in alum (alum, 4 ounces; water, 20 ounces) for five minutes before toning in this bath. Another thorough washing is necessary between the alum and toning baths.

See Illustration, facing page 746.

MARIONA PAPER (P.O.P.).

Directions.—Print as with albumenised papers, slightly darker than required for the finished picture, or for partial development, as instructions below.

Washing.—After printing, wash thoroughly in several changes of water from ten to fifteen minutes.

Toning.—This paper may be toned with any of the usual baths, but the following are recommended :—

PLATINUM TONING.—FOR SEPIA TONES.

Stock Solution.

A. Potassium chloro-platinite, 15 grains in 15 ounces of water, to which have been previously added 5 minims of hydrochloric acid.

B.	Citric acid	160 grains.
	Chloride sodium	160 „
	Water	8 ounces.

Take 2 ounces from A and 1 ounce from B, and make up to 1½ pints with water. This is sufficient for toning two sheets.

GOLD TONING.—CARBONATE BATH.

A. Stock solution of gold chloride, 15 grains tube in 15 ounces of water.
B. Sodium carbonate (common washing soda), 30 grains in 15 ounces of water.

Take 2½ ounces each of A and B, and make up to 1 pint. This should tone about 2½ sheets of paper.

GOLD TONING.—SULPHOCYANIDE BATH.

A. Stock solution of gold chloride, 15 grains in 15 ounces of water.
B. Stock solution of ammonium sulphocyanide containing 15 grains to every ounce of water.

For use, take 1 ounce each of A and B, and make up to 8 or 10 ounces with water, for each sheet of paper to be toned. The bath should be fresh every time.

Washing after Toning.—To be thoroughly washed in several changes of water, then placed in the fixing bath.

Fixing Bath.—Dissolve 3 ounces of hypo in 1 pint of water. Keep the prints moving for at least 10 minutes.

Final Washing.—In running water, or several changes of water, for at least two hours.

Alum Bath.—In warm weather or hot climates it is advisable to use this bath before toning; strength about ten per cent, or chrome alum one per cent, for ten minutes, prints being again thoroughly washed before toning.

Partial Development.—This method will be found very convenient in dull weather, or even at night by magnesium or electric light. Print till the image is fairly visible, then immerse without washing in a ten per cent. solution of potassium bromide for four or five minutes. Then, after washing for a few minutes, place the print in the following developer mixed in equal proportions:—

A.	Hydroquinone	80 grains.
	Sodium sulphite	320 ,,
	Make up to 1 pint with distilled water.	
B.	Sodium carbonate	400 grains.
	Ammonium carbonate	400 ,,
	Ammonium bromide	40 ,,
	Make up to 1 pint with distilled water.	

Continue the development until all but the faintest details are visible, then immediately wash the print thoroughly in running water to remove entirely the developer before placing it in the toning bath. All after-treatment will be the same as given above for printed-out prints.

THE COLLODIO-CHLORIDE PROCESS.

PAGET PRIZE COLLODIO-CHLORIDE PRINTING-OUT PAPER.

Printing should be somewhat darker than the finished print is required; about the same as for our P.O.P., not quite so dark as for albumen.

Keeping.—Both the unprinted pieces of paper and the untoned prints are best kept in a cool place, closely packed together, flat, and under slight pressure. If left loosely exposed to the air, the collodion film may dry and harden, becoming more liable to crack during the toning and subsequent operations. Toning should be done as soon after printing as convenient; the same day, or, at farthest, the next day if possible.

Washing.—Before immersion in the toning bath, the prints should be *very thoroughly washed* for at least five minutes in running water or in three or four changes. If running water from a tap be used, it should not be turned on too violently, as it may tear or injure the film.

Alum.—After washing, it is strongly recommended that the prints be placed in an alum bath (alum, 4 ounces; water, 1 pint) for five minutes, and then washed for a quarter of an hour before toning. The alum has no action on the collodion film, but hardens the prepared paper underneath, and effectually prevents any softening or peeling in the subsequent operations. If the alum be well washed out, toning proceeds even more easily than if alum had not been used.

Toning.—Any of the ordinary toning baths employed for albumen or gelatine may be used, but no bath gives such rich, brilliant tones, either warm or cold, as the sulphocyanide. If a little care be taken to ensure clean dishes and clean fingers, there is no bath more simple or certain. We strongly recommend this bath in preference to any other.

Sulphocyanide of ammonia	30 grains.
Gold chloride	2 ,,
Water	16 ounces.

Tone to exactly the colour desired, judging the prints as they lie in the dish; but it should be borne in mind that the finished image will be slightly bluer and stronger when dry than in the wet state. Wash and fix in

Hyposulphite of soda	3 ounces.
Water	1 pint.

If this bath be found to tone too quickly, sulphite of soda may be added at the rate of ¼ to ½ grain for every grain of gold used (say 1 grain for above quantity). This will make the bath work more slowly, without making any other difference. More or less may be used, so as to regulate to speed desired. The sulphite should be kept in a stock solution, and added to the bath immediately before use.

Allow at least ten minutes for fixing. Wash thoroughly in running

water for at least an hour. Do not on any account wash longer than two hours; never leave in the water all night.

The prints may be damped off on blotting-paper and left to dry, or may be dried quickly in a moderate heat. They should *not* be left to dry *between* blotting-paper unless the latter is known to be pure. Impure blotting-paper makes spots and mottled marks on the prints.

THE ALBUMEN PROCESS.

PRESERVATIVES FOR SENSITISED ALBUMEN PAPER.

1.—Sensitise the paper in the usual bath, drain well, and when superficially dry float the back of the paper for twenty minutes on a solution of

Citric acid	1 ounce.
Water	30 ounces.

Or,

2.—Sensitise as usual, drain well, and wash the paper in three or four changes of water, then float the back on a solution of

Nitrite of potassium	5 ounces.
Water	100 ,,

When dry, roll the paper up, coated side out, and wrap in blotting-paper soaked in the nitrite of potash solution, and dried.

TONING FORMULÆ FOR ALBUMEN PRINTS.

No. 1.	Chloride of gold	1 grain.
	Acetate of soda	30 grains.
	Water	8 ounces.

This must not be used till one day after preparation. It keeps well, and gives warm, rich tones.

No. 2.	Chloride of gold	1 grain.
	Bicarbonate of soda	4 grains.
	Water	8 ounces.

This is ready for immediate use after preparation, but it will not keep.

No. 3.	Chloride of gold	1 grain.
	Phosphate of soda	20 grains.
	Water	8 ounces.

This gives rich tones of a deep purple nature, but must be used soon after preparation.

No. 4.	Gold solution	10 drachms.
	Acetate of lime	20 grains.
	Chloride of lime	1 grain.
	Tepid water	20 ounces.

The 'gold solution' before mentioned is prepared by neutralising as much as is required of a one-grain solution of chloride of gold by shaking it up with a little prepared chalk, then allowing it to settle, and filtering off the clear liquid. This toning bath improves by keeping. To use, add two ounces of it to eight ounces of tepid water, which will prove sufficient to tone a full-sized sheet of paper.

No. 5.	Chloride of gold	15 grains.
	Water	5 ounces.

Neutralise with lime water, make up to fifteen ounces with water, and add two drachms of chloride of calcium. This stock solution will keep for a long time for use. Dilute one ounce with ten ounces of water.

Toning and Fixing in One Bath.

No. 6.	Chloride of gold	1 grain.
	Phosphate of soda	15 grains.
	Sulphocyanide of ammonium	25 ,,
	Hyposulphite of soda	240 ,,
	Water	2 ounces.

Dissolve the gold separately in a small quantity of water, and add it to the other solution.

INGALL'S TONING FORMULA.

Hard water ....(fluid)	20 ounces.
Bi-carbonate of potash	20 grains.
Gold	2 ,,

= 2 drachms solution 1 grain to 1 drachm hard water.

NEGATIVE INTENSIFIERS.

MONCKHOVEN'S.

1. A. Bromide of potassium	10 grains.
Bichloride of mercury	10 ,,
Water	1 ounce.
B. Pure cyanide of potassium	10 grains.
Nitrate of silver......................................	10 ,,
Water	1 ounce.

Place the negative in A till it is white, then rinse and transfer it to solution B. If the intensification has been carried too far, it may be reduced by treatment with a weak solution of hyposulphite of soda.

MERCURY AND AMMONIA.

Pour over the negative a saturated solution of mercuric chloride (bichloride of mercury); do not keep it on too long, unless the negative is very thin. Wash well, and immerse in bath of—

Water	10 ounces.
Ammonia	10 minims.

Leave the plate in this solution until the black colour goes quite through the film.

MERCURY WITH SODIUM SULPHITE.

Whiten the negative in the saturated solution of mercuric chloride, wash and blacken with a solution of sulphite of sodium 1 in 5.

IODIDE OF MERCURY.

Dissolve one drachm of bichloride of mercury in seven ounces of water, and three drachms of iodide of potassium in three ounces of water, and pour the iodide solution into the mercury till the red precipitate formed is completely dissolved.

For use, dilute with water, flow over the negative till the proper density is reached, and wash, when the deposit will turn yellow. Remove the yellow colour by flowing a five per cent. solution of hypo over the plate, and give it the final washing.

URANIUM.

Uranium nitrate	12 grains.
Potassium ferricyanide	15 „
Water (fluid)	4 ounces.

Before using this intensifier, great care is necessary that every trace of hypo is dissolved from the film, or red fog will result.

FERRICYANIDE OF LEAD.

The negative, after washing, is placed in a solution made as follows:—

Lead nitrate	20 grains.
Ferricyanide of potassium	30 „
Distilled water	1 ounce.

After this it is again thoroughly washed until the drainings from the plate give a scarcely perceptible blue colour with ferrous-sulphate solution, and then ammonium sulphide (one part to ten parts of water) is poured over it.

BROMIDE OF COPPER.

A.	Potassium bromide	180 grains.
	Water	10 ounces.
B.	Cupric sulphate	240 grains.
	Water	10 ounces.

Mix the solutions, and, after standing a few hours, decant or filter out any potassium sulphate that may be precipitated. The solution will keep indefinitely, and may be used over and over again.

The *modus operandi* of intensification is the same as with the mercuric salt. The darkening or rendering sufficiently opaque of the deposit can be done by a solution of ammonia in water—say, water, 10 ounces; stronger solution of ammonia, 1 drachm. The application of any old developer will bring about the same result.

NEGATIVE REDUCERS.

FARMER'S.

Saturated solution of ferridcyanide of potassium	1 part.
Hyposulphite of soda solution, 1·5	10 parts.

L. BELITZKI'S.

Potassium ferric oxalate	1 to 10 grains.
Hyposulphite of soda solution, 1 to 5	1 ounce.

CYANIDE REDUCING SOLUTION.

Cyanide of potassium	20 grains.
Iodide of potassium	10 ,,
Bichloride of mercury	10 ,,
Water	10 ounces.

Reduction takes place slowly and is easy to control. After reducing, the negative should be washed thoroughly.

Perchloride of iron	30 grains.
Citric acid	60 ,,
Water	1 pint.

ORTHOCHROMATIC PROCESSES.

F. E. IVES'S (DRY COLLODION).

Use any good bromide collodion emulsion that contains no free nitrate of silver. Flow plate as usual, and, as soon as the emulsion film sets, flow several times with strong alcoholic solution of chlorophyl from blue myrtle or plantain leaves, then immerse in water strongly tinted with blue shade eosine, and keep in motion until smooth.

Sensitises for all colours, including deep ruby red. A very light yellow screen is sufficient to secure correct rendering of colour tone.

V. SCHUMANN'S (GELATINE PLATES).

Soak the plate in 200 c. c. of water and 2 to 4 c. c. of ammonia for two to three minutes, then immerse in

Distilled water	200 c. c.
Alcohol	10 ,,
Ammonia	4 ,,
Alcoholic solution of cyanine, 1 : 500	10 ,,

DRS. MALLMANN AND SCOLIK'S (GELATINE PLATES).

Preliminary Bath.

A. Water	200 c. c.
Ammonia	2 ,,

Soak the plate for two minutes.

Colour Bath.

Erythrosine solution, 1·1000	25 c. c.
Ammonia	4 ,,
Water	175 ,,

The plate should not remain longer in this bath than one and a quarter minute. A longer time depresses the general sensitiveness.

Alcohol	500 c. c.
Chinoline red	1 gramme.

To which are added 50 c. c. of a solution of—

Alcohol	500 c. c.
Chinoline blue (cyanine)	1 gramme.

OBERNETTER'S FORMULA.

Distilled water	480 c. c.	= 16 fluid ounces.
Nitrate of silver	1·25 gramme	= 25 grains,
Ammonium carbonate	5 "	= 75 "
Erythrosine solution (1 in 500)	35 c. c.	= 1⅛ fluid ounces.
Strong ammonia	4 c. c.	= 1 drachm.

Bathe the plate in the preliminary solution (Mallmann and Scolik's formula) for 150 seconds.

Without washing, flow the sensitising solution over the plate twice, and dry in the dark closet.

HYPO ELIMINATORS CLEARING SOLUTIONS, &c.

TO RESTORE FADED NEGATIVES.

Mr. W. E. Debenham recommends the following solution for the purpose of restoring printing force to negatives which have faded after mercurial intensification:—

Schlippe's salt	10 grains.
Water	1 ounce.

Wet the film thoroughly by soaking in a dish of water, and immerse in the restoring solution until the desired effect is obtained.

TO REMOVE THE LAST TRACES OF HYPO FROM THE FILM.

HYDROXYL.

Peroxide of hydrogen (twenty vols.)	1 drachm.
Water	5 ounces.

After washing the negative well it is immersed for a couple of minutes in the solution and again rinsed in water, when the intensification with silver can be at once proceeded with.

ANOTHER.

Where peroxide of hydrogen is not obtainable the following may be used as a substitute, the solution containing that substance in combination with others:—

Barium dioxide	1 ounce.
Glacial acetic acid	1 ,,
Water	4 ounces.

Reduce the barium dioxide to a fine powder and add it gradually to the acid and water, shaking until dissolved. A few minutes' immersion in this solution will effectually remove or destroy the last traces of hypo.

ALUM.

A simple plan brought forward by Captain Abney for this specific purpose consists in employing a saturated solution of alum in place of the solution of hydroxyl or peroxide of hydrogen.

EAU DE JAVELLE.

Dry chloride of lime (hypochlorite of lime)	2 ounces.
Carbonate of potash	4 ,,
Water	40 ,,

Mix the chloride of lime with thirty ounces of the water; dissolve the carbonate of potash in the remainder. Mix, boil, and filter.

LABARRAQUE'S SOLUTION.

Chloride of lime	2 ounces.
Carbonate of soda	4 ,,
Water	40 ,,

Mix the chloride of lime with thirty ounces of the water, and dissolve the carbonate of soda in the remainder. Mix, boil, and filter.

CLEARING SOLUTIONS.

Alum	2 ounces.
Citric acid	1 ounce.
Water	10 ounces.

Wash moderately after fixing, and immerse the negative in the above.

ANOTHER.

Saturated solution of alum	20 ounces.
Hydrochloric acid (commercial)	1 ounce.

Immerse the negative after fixing, having previously washed it for two or three minutes under the tap; wash well after removal from the alum and acid.

NEGATIVE VARNISHES, FORMULÆ FOR.

No. 1.	Sandarac	4 ounces.
	Alcohol	28 ,,
	Oil of lavender	3 ,,

This is a good varnish for retouching upon, as a 'tooth' is easily obtained by rubbing.

No. 2.	White hard varnish	15 ounces.
	Methylated alcohol	20 to 30 ,,

This will be found a good and cheap varnish if durability is not required, as it is easily rubbed up for retouching upon and easily cleaned off. Very suitable for enlarged negatives that are not to be retained.

Tough, hard, and durable:—

No. 3.	Bleached shellac	1¼ ounce.
	Mastic	¼ ,,
	Oil of turpentine	¼ ,,
	Sandarac	1¼ ,,
	Alcohol	20 fluid ounces.

No. 4.	Sandarac	80 ounces.
	Turpentine	36 ,,
	Oil of lavender	10 ,,
	Alcohol	500 ,,

This one may be rubbed down with powdered resin, and gives a splendid surface for retouching:—

No. 5.	Sandarac	1 ounce.
	Seed lac	1½ ,,
	Castor oil	3 drachms.
	Oil of lavender	1½ drachm.
	Alcohol	18 fluid ounces.

This varnish is somewhat dark in colour.

No. 6.	Best orange shellac	2½ ounces.
	Oil of lavender or oil of turpentine	½ ounce.
	Methylated alcohol	1 pint.

Keep in a warm place until dissolved; then add a large teaspoonful of whiting or prepared chalk; set aside to clear, and then decant. This is specially recommended for gelatine negatives.

Retouching Varnish.

Sandarac	1 ounce.
Castor oil	80 grains.
Alcohol	6 ounces.

First dissolve the sandarac in the alcohol, and then add the oil.

In the above formulæ the proportions of alcohol must be taken as approximate, as different samples of resins vary, some giving more viscous solutions than others.

Ground-glass Varnish.

Sandarac	90 grains.
Mastic	20 ,,
Ether	2 ounces.

Dissolve the resins in the ether and afterwards add

Benzole	½ to 1½ ounce.

The proportion of the benzole added determines the nature of the matt obtained.

THE WET-COLLODION PROCESS.

Pyroxyline (Hardwich).

Sulphuric acid 1·845	(fluid)	18 ounces.
Nitric acid 1·457	,,	6 ,,
Water	(fluid)	5 to 5¼ ,,
Cotton-wool		300 grains.

Temperature 150° Fahr. Time of immersion, 10 minutes.

Iodised Collodion (for Negatives).

For Acid Pyro Developer.

Ether, s.g. ·725	10 fluid ounces.
Alcohol, s.g. ·805	4 ,,
Pyroxyline	120 grains.
Iodide of ammonium	30 ,,
,, cadmium	45 ,,
Alcohol ·830	4 fluid ounces.

Bromo-iodised Collodion (for Negatives).

Iron Developer.

Ether, s.g. ·725	10 fluid ounces.
Alcohol, s.g. ·805	5 ,,
Pyroxyline	120 grains.
Iodide of ammonium	40 ,,
,, cadmium	40 ,,
Bromide of ,,	20 ,,
Alcohol ·830	5 fluid ounces.

BROMO-IODISED COLLODION (for Positives or Ferrotypes).

Ether, s.g. ·725	10 fluid ounces.
Alcohol, s.g. ·805	5 ,,
Pyroxyline	100 grains.
Iodide of cadmium	50 ,,
Bromide of ammonium	25 ,,
Alcohol ·830	5 fluid ounces.

Note.—The iodides should be dissolved in the weaker spirit and the pyroxyline in the ether and stronger spirit, and the two solutions mixed.

THE NITRATE BATH (for Negatives)

Nitrate of silver (recrystallised)	6 ounces.
Distilled water	80 fluid ounces.
Nitric acid (pure)	8 minims.

Saturate with iodide of silver, then filter.

This is best done by coating a plate with collodion and leaving it in the bath for some hours.

(For Positives or Ferrotypes.)

Nitrate of silver (recrystallised)	5½ ounces.
Distilled water	80 fluid ounces.
Nitric acid (pure)	½ drachm.

Saturate with iodide of silver and filter as above.

DEVELOPER.

FOR NEGATIVES.

No. 1.	Ferrous sulphate	½ ounce.
	Glacial acetic acid	½ ,,
	Alcohol	½ ,,
	Water	10 ounces.
No. 2.	Ammonio-sulphate of iron	75 grains.
	Glacial acetic acid	75 ,,
	Sulphate of copper	7 ,,
	Water	4 ounces.
	Alcohol	¼ ounce,

FOR COLLODION POSITIVES OR FERROTYPES.

Ferrous sulphate	150 grains.
Glacial acetic acid	½ ounce.
Nitric acid	5 minims.
Alcohol	½ ounce.
Water	10 ounces.

Note.—By increasing the proportion of nitric acid and decreasing that of the acetic, the image will be more metallic in appearance.

Nitrate of Iron Developer for Positives.

Ferrous sulphate	1½ ounce.
Nitrate of baryta	1 ,,
Water	1 pint.
Alcohol	1 ounce.
Nitric acid	40 drops.

The insoluble sulphate of baryta which is formed must be filtered out.

Fixing Solution for Positives.

Cyanide of potassium	½ ounce.
Water	15 to 20 ounces.

For Collodion Transfers.

Pyrogallic acid	5 grains.
Citric acid	3 ,,
Acetic acid	20 minims.
Water	1 ounce.
Alcohol	20 minims.

PYROXYLINE FOR DRY-COLLODION PROCESSES.

For Collodio-bromide or Unwashed Emulsion.

Nitric acid, s.g. 1·45	2 fluid ounces
Sulphuric acid, s.g. 1·845	4 ,,
Water	1 fluid ounce.
Cotton (cleaned and carded)	100 grains.
Temperature	150° Fahr.
Time of immersion	10 minutes.

For Washed Emulsion.

Nitric acid, s.g. 1·45	2 fluid ounces.
Sulphuric acid, s.g. 1·845	3 ,,
White blotting-paper	145 grains.
Temperature	100° Fahr.
Time of immersion	30 minute

THE COLLODIO-BROMIDE PROCESS.

COLLODIO-BROMIDE EMULSION.

Ether, s.g. ·720	5 fluid ounces.
Alcohol, s.g. ·820	3 ,,
Pyroxyline	50 grains.
Bromide of cadmium and ammonium	80 ,,
or Bromide of zinc	76 ,,

Sensitise by adding to each ounce fifteen grains of nitrate of silver, dissolved in a few drops of water and one drachm of boiling alcohol. This is suitable for slow landscape work or for transparencies.

WASHED EMULSION (for Landscapes).

No. 1.

Ether, s.g. ·720	4 fluid ounces.
Alcohol, s.g. ·820	2¾ ,,
Pyroxyline	40 grains.
Castile soap (dissolved in alcohol)	30 ,,
Bromide of ammonium and cadmium	84 ,,

Sensitise with one hundred grains of nitrate of silver dissolved in one ounce of boiling alcohol; and, after standing ten days, add a further twenty grains of silver dissolved as before in two drachms of alcohol.

No. 2 (rapid).

Ether, s.g. ·720	4 fluid ounces.
Alcohol, s.g. ·820	2½ ,,
Pyroxyline	40 grains.
Castile soap	30 ,,
Bromide of ammonium and cadmium	56 ,,

Sensitise with 125 grains of nitrate of silver, dissolved, as before, in one ounce of alcohol with the aid of heat. In twelve hours' time add thirty grains more of the double bromide of ammonium and cadmium dissolved in half an ounce of alcohol.

FOR WASHED EMULSION (for Transparencies).

Ether, s.g. 720	5 fluid ounces.
Alcohol, s.g. ·820	3 ,,
Pyroxyline or papyroxyline	60 grains.
Bromide of cadmium and ammonium	100 ,,
or Bromide of zinc	96 ,,
Hydrochloric acid, s.g. 1·2	8 minims.

Sensitise with twenty grains of nitrate of silver to each ounce, dissolved in a minimum of water with two drachms of boiling alcohol. Allow to stand for two or three days.

N.B.—In the three last formulæ, the emulsion, after being allowed to ripen for the time stated, should be poured into a dish and allowed to become thoroughly dry. The mass of dry emulsion is then washed, to remove all the soluble salts, and is then again dried and redissolved in equal parts of ether and alcohol, at the rate of from twenty to twenty-four grains to the ounce of solvents.

DEVELOPING SOLUTIONS FOR COLLODION EMULSION.

SOLUTION A.

Pyrogallic acid	96 grains.
Alcohol	1 fluid ounce.

Solution B.

Bromide of potassium	10 grains.
Water	1 fluid ounce.

Solution C.

Liquor ammoniæ, s.g. ·880	1 fluid drachm.
Water	15 fluid drachms.

or D.

Carbonate of ammonium	120 grains.
Water	1 fluid ounce.

For each drachm of developer take, for a normal exposure, five minims of A, one or two minims of B, and one or two minims of C; or, if D be used, add the above quantities of A, B, and C, to one drachm of D. When the details of the image are out, add double the quantities of B and C.

WELLINGTON'S COLLODIO-BROMIDE EMULSION FORMULÆ.

Pyroxyline	30 grains.
Ether	12 drachms.
Alcohol	12 ,,

To bromise, add 30 grains bromide ammonium dissolved in 45 minims water, to which 4 drachms of alcohol are afterwards added; 50 grains of nitrate of silver dissolved in a drachm of water are then added. After washing and drying, the pellicle is dissolved in 1¾ ounces of ether and 1¾ ounces alcohol.

Developer.

No. 1.	Pyrogallic acid	1 ounce.
	Sulphite of soda	4 ounces.
	Water	18 ,,
No. 2.	Potassium carbonate	3 ounces.
	Sulphite of soda	2 ,,
	Water	18 ,,
No. 3.	Bromide ammonium	1 ounce.
	Water	10 ,,

Use equal parts of each without dilution.

NESBIT'S FORMULÆ.

Pyroxyline	60 grains.
Methylated alcohol	2¾ ounces.
Ether	2¼ ,,
Bromide ammonium (in water 100 minims) ...	63 grains.
Alcohol	1 ounce.
Nitrate of silver	100 grains.
Water	60 minims.

After washing and drying, redissolve in alcohol 4 ounces, ether 4 ounces.

INTENSIFYING SOLUTIONS FOR COLLODION EMULSION.

Nitrate of silver	60 grains.
Citric acid	30 ,,
Nitric acid	30 minims.
Water	2 ounces.

To each drachm of a three-grain solution of pyrogallic acid add two or three minims of the above, and apply until sufficient density is attained.

GELATINE EMULSION PROCESSES.

W. K. BURTON'S FORMULA.

A.	Bromide of ammonium	260 grains.
	Iodide of potassium	20 ,,
	Gelatine (Nelson No. 1)	80 ,,
	Distilled water	10 ounces.
B.	Silver nitrate (dry)	200 grains.
C.	Silver nitrate	200 grains.
	Distilled water	1 ounce.

Converted to ammonio-nitrate.

D.	Gelatine, hard (dry)	600 grains.

BURBANK'S FORMULA.

Water	1 ounce.
Bromide of ammonium	15 to 20 grains

Or,

Bromide of potassium	18 to 25 grains.
Nitrate of silver, proportioned to the amount of bromide	25 to 30 grains.
Gelatine	30 to 40 ,,

CAPTAIN ABNEY'S FORMULA.

1. Potassium bromide	10 grains.
2. Ammonium bromide	140 ,,
3. Nelson's No. 1 gelatine	30 ,,
4. Silver nitrate	200 ,,
5. Nelson's No. 1 gelatine	80 ,,
6. Coignet's special	80 ,,

CHARLES BENNETT'S FORMULA.

Ammonium bromide	70 grains.
Silver nitrate..	110 ,,
Gelatine	200 ,,
Distilled water	6 ounces.

DR. EDER'S AMMONIA FORMULA.

1. Potassium bromide	370 grains
Gelatine .... 520 to	700 ,,
Water	10½ ounces.
2. Silver nitrate	460 grains.
Water	10½ ounces.

Strong ammonia is added to No. 2 until the precipitate is just redissolved.

DR. VAN MONCKHOVEN'S FORMULA.

1. Hydrobromic acid (sufficient to dissolve 150 grains of silver nitrate).

Gelatine	40 grains.
Water	7 ounces.
2. Silver nitrate	150 grains.
Bicarbonate of soda	*q.s.* to precipitate the carbonate.
3. Gelatine	30 grains.
Water (hot)	7 ounces.

Nos. 2 and 3 are mixed and then No. 1 added, 150 grains of gelatine being finally introduced.

A. L. HENDERSON'S FORMULA.

Silver nitrate	120 grains.
Water	3 ounces.
Potassium carbonate	60 to 90 grains.
Water	3 ounces.
Potassium bromide	90 grains.
,, iodide	1 grain.
Gelatine	20 grains.

MISCELLANEOUS FORMULÆ.

THE 'DUSTING-ON' PROCESS.

No. 1.	Saturated solution of bichromate of ammonium	5 drachms.
	Honey	3 ,,
	Albumen	3 ,,
	Distilled water	20 to 30 ,,
No. 2.	Dextrine	½ ounce.
	Grape sugar	½ ,,
	Bichromate	½ ,,
	Water	½ pint.
No. 3.	Gum arabic	6 parts.
	Bichromate of potash	2·5 ,,
	Grape sugar	4 ,,
	Water	72 ,,

SILVERING MIRRORS (Martin's Method).

(*In employing the following formulæ, it should be well understood that the glass plate to be silvered must be scrupulously clean.*)

A.	Nitrate of silver	175 grains.
	Distilled water	10 ounces.
B.	Nitrate of ammonium	262 grains.
	Distilled water	10 ounces.
C.	*Pure* caustic potash	1 ounce (avoirdupois).
	Distilled water	10 ounces.
D.	Pure sugar candy	½ ounce (avoirdupois).
	Distilled water	5 ounces.

Dissolve and add—

Tartaric acid .... 50 grains.

Boil in a flask for ten minutes, and when cool add—

Alcohol .... 1 ounce.

Distilled water *quant. suff.* to make up to 10 ounces.

For use take equal parts of A and B. Mix together also equal parts of C and D, and mix in another measure. Then mix both these mixtures together in the silvering vessel, and suspend the mirror face downward in the solution.

INK FOR RUBBER STAMPS.

Aniline red (violet)	90 grains.
Boiling distilled water	1 ounce.
Glycerine	half a teaspoonful.
Treacle	half as much as glycerine.

TO RECOVER FOGGED PLATES.

Make a solution as follows:—

Chromic acid	30 grains.
Bromide of potassium	60 ,,
Water	10 ounces.

And immerse the plates for five minutes. Afterwards wash very thoroughly, and rear up to dry.

Or, instead of the above, make the following:—

Bichromate of potash	1 ounce.
Hydrobromic acid	2 drachms.
Water	10 ounces.

If hydrobromic cannot be obtained, use hydrochloric acid or a soluble bromide; in the last case a few drops of sulphuric acid being added to the solution. Use as before.

SOLUTION FOR MOUNTING PRINTS WITHOUT THEIR COCKLING.

Nelson's No. 1 photographic gelatine	4 ounces.
Water	16 ,,
Glycerine	1 ounce.
Methylated alcohol	5 ounces.

Dissolve the gelatine in the water, then add the glycerine, and lastly the spirit.

ENCAUSTIC PASTE.

Pure wax	500 parts.
Gum elemi	10 ,,
Benzole	200 ,,
Essence of lavender	300 ,,
Oil of spike	15 ,,

BACKING SHEETS FOR DRY PLATES.

Gelatine	1 part.
Water	2 parts.
Glycerine	1 part.
Indian ink	A small addition.

Make a paste, and coat strong paper; place the prepared material, face downwards, on waxed glass to set. Press to back of plate before putting into dark slide.

SENSITISING SOLUTION FOR CARBON TISSUE.

Bichromate of potash	1 ounce.
Water	20 to 30 ounces.
Liquor ammoniæ	20 minims.

A strong solution should be used for hard negatives and a more dilute one for soft negatives.

WAXING SOLUTION.

For Carbon Prints, or for Removing Collodion Films.

No. 1.	Beeswax	20 grains.
	Benzole rect. No. 1	4 ounces.

For Flexible Supports (Autotype).

No. 2.	Yellow resin	3 drachms.
	Yellow beeswax	1 drachm.
	Rectified spirits of turpentine	10 ounces.

ALBUMEN PROCESS FOR TRANSPARENCIES.

Iodised Albumen.

Albumen	10 ounces.
Liquor ammoniæ	½ drachm.
Iodide of ammonium	50 grains.
Bromide of ammonium	10 ,,

Silver Bath.

Water	10 ounces.
Nitrate silver	1 ounce.
Glacial acetic acid	1 ,,

Coat the glass with old iodised collodion and when it has set wash under the tap, drain, and coat with the albumen. When dry, sensitise for 1 minute, wash, and again dry.

Developer.

Pyrogallic acid	30 grains.
Citric acid	20 ,,
Water	10 ounces.

Use warm (120° Fahr.) and add 2 or 3 drops of a 20-grain solution of nitrate of silver per ounce at the time of using. Fix in a solution of hyposulphite of soda 4 ounces to the pint. Tone with gold if the colour is too brown.

LUBRICANT FOR BURNISHING PRINTS.

Castile soap	20 grains.
Alcohol	10 ounces.

BACKING FOR DRY PLATES TO PREVENT HALATION (Teape's).

Gum solution (ordinary office gum)	1 ounce.
Caramel	1 ,,
Burnt sienna, ground in water	2 ounces.
Mix and add alcohol	2 ,,

COLOUR FOR APPLYING TO BRIGHT MACHINERY PRIOR TO PHOTOGRAPHING IT.

Mix white lead with turpentine to the consistence of thin cream, with sufficient lamp-black to form a light slate colour, and then add one-sixth the bulk of japanners' gold size. Paint the machinery over with this. After the photograph has been taken, the colour can be quickly removed with a pledget of 'cotton waste' moistened with turpentine or benzoline.

RETOUCHING MEDIUM.

Pale resin	1 ounce.
Oil of turpentine	1 ,,
Oil of lavender	2 ounces.

TO PREVENT BLISTERS IN ALBUMEN PRINTS.

Before wetting the prints immerse them in methylated spirit, then wash and tone as usual.

TO REMOVE GELATINE NEGATIVES FROM THE GLASS.

Immerse the plate in water to which a few drops per ounce of hydrofluoric acid have been added. If the film expands, as most likely it will, immersion in spirit will bring it to its original dimensions.

PRINTING ON PLAIN PAPER.

Prepare the plain paper with

Ammonium chloride	60 to 80 grains.
Sodium citrate	100 ,,
Sodium chloride	20 to 30 ,,
Gelatine	10 ,,
Distilled water	10 ounces.
or, Ammonium chloride	100 grains.
Gelatine	10 ,,
Water	10 ounces.

The gelatine is first swelled in cold water and then dissolved in hot water, and the remaining components of the formula are added. The solution is filtered, and, when still warm, the paper floated upon it for three minutes.

The salted paper is sensitised upon a neutral 45-grain silver bath.

PLATINUM TONING BATH FOR PLAIN SILVER PRINTS.

Chloroplatinite of potassium	1 gramme.
Water	1 litre.
Nitric acid	5 to 10 drops.

INVISIBLE INK.

Chloride of cobalt	50 grains.
Distilled water	1 fluid ounce.
Glycerine	10 minims.

Dissolve the chloride of cobalt in the distilled water, and add the glycerine.

Writing executed with this ink is invisible on paper, but, on warming, the writing turns blue. On exposure to damp air it becomes invisible again.

SOLUTION FOR MAKING PAPER ADHERE TO METAL.

Tragacanth	30 grammes.
Gum arabic	120 ,,
Water	500 c. c.

To Clean Slimy Sponges.—Dissolve one ounce of fused chloride of calcium in eight ounces of water. Wet the sponge, then submerge it in the solution until the slimy substance disappears, after which wash in plain water.

Removal of Oil Stains.—Mix pipe-clay or fullers' earth with cold water to a paste, and apply some of it to the soiled spot, without friction, so as not to injure the design. After having remained there for about twelve hours, it is removed and the remains brushed off. The porous material, after the water has evaporated, soaks up at least a portion of the oil. If the stain does not disappear by one application, it is to be repeated.

To Dry a Gelatine Negative Quickly.—After being fixed and well washed lay the negative, face up, on a sheet of blotting-paper, and covering it with another sheet of blotting-paper, rub the hand all over the surface until the negative is surface dry. Then place it in a current of air for a few minutes. A cambric handkerchief or soft towel will answer instead of blotting-paper. If the negative be immersed in alcohol it will absorb and displace the water in the film, and thus permit of a quick drying by the agency of heat if necessary.

Removing Rust from a Lens.—A lens sometimes acquires a brown, rusty stain on the surface, which no amount of rubbing or cleaning will remove. By applying a paste composed of putty powder and water to the stains, and then rubbing briskly with either the point of the finger or the side of the hand, every spot of rust or stain will be removed in a few minutes. This applies to photographic or other lenses, except the object glass of a telescope, which would be irreparably damaged by such treatment.

CONVERSION OF GRAINS AND OUNCES INTO GRAMMES.

	Grains to Grammes.	Ounces to Grammes.	Grains to the Ounce=Grammes to 100 c.c.
1	0·06479	28·3495	0·22817
2	0·12958	56·9660	0·45635
3	0·19437	85·0485	0·68452
4	0·25916	113·3980	0·91269
5	0·32395	141·7475	1·14086
6	0·38874	170·0970	1·36904
7	0·45353	198·4465	1·59721
8	0·51832	226·7960	1·82538
9	0·58311	255·1455	2·05356

CONVERSION OF MINIMS, DRACHMS, OUNCES, AND PINTS TO CUBIC CENTIMETRES AND LITRES.

	Minims to c.c.	Drachms to c.c.	Ounces to c.c.	Pints to Litres.
1	0·05916	3·5495	28·396	0·56792
	0·11832	7·0990	56·792	1·13584
3	0·17748	10·6485	85·188	1·70376
	0·23664	14·1980	113·584	2·27168
5	0·29580	17·7475	141·980	2·83960
6	0·35496	21·2970	170·376	3·40752
7	0·41412	24·8465	198·772	3·97544
8	0·47328	28·3960	227·168	4·54336
9	0·53244	31·9455	255·564	5·11128

FRENCH AND ENGLISH WEIGHTS AND MEASURES.

FRENCH FLUID MEASURES.

The cubic centimètre, usually represented by 'c. c.,' is the unit of the French measurement for liquids. It contains nearly seventeen minims of water; in reality, it contains 16·896 minims. The weight of this quantity of water is one gramme. Hence it will be seen that the cubic centimètre and the gramme bear to each other the same relation as our drachm for solids and the drachm for fluids, or as the minim and the grain. The following table will prove to be sufficiently accurate for photographic purposes:—

1 cubic centimètre	=	17 minims (as near as possible).					
2 cubic centimètres	=	34 ,,					
3 ,,	=	51 ,,					
4 ,,	=	68 ,,	or 1 drachm	8 minims.			
5 ,,	=	85 ,,	,, 1 ,,	25 ,,			
6 ,,	=	102 ,,	,, 1 ,,	42 ,,			
7 ,,	=	119 ,,	,, 1 ,,	59 ,,			
8 ,,	=	136 ,,	,, 2 drachms	16 ,,			
9 ,,	=	153 ,,	,, 2 ,,	33 ,,			
10 ,,	=	170 ,,	,, 2 ,,	50 ,,			
20 ,,	=	340 ,,	,, 5 ,,	40 ,,			
30 ,,	=	510 ,,	,, 1 ounce	0 drachm	30 minims.		
40 ,,	=	680 ,,	,, 1 ,,	3 drachms	20 ,,		
50 ,,	=	850 ,,	,, 1 ,,	6 ,,	10 ,,		
60 ,,	=	1020 ,,	,, 2 ounces	1 ,,	0 ,,		
70 ,,	=	1190 ,,	,, 2 ,,	3 ,,	50 ,,		
80 ,,	=	1360 ,,	,, 2 ,,	6 ,,	40 ,,		
90 ,,	=	1530 ,,	,, 3 ,,	1 ,,	30 ,,		
100 ,,	=	1700 ,,	,, 3 ,,	4 ,,	20 ,,		

THE CONVERSION OF FRENCH INTO ENGLISH WEIGHTS.

Although a gramme is equal to 15·4346 grains, the decimal is one which can never be used by photographers; hence in the following table it is assumed to be $15\frac{2}{5}$ grains, which is the nearest approach that can be made to *practical* accuracy:

1 gramme	=	$15\frac{2}{5}$ grains.			
2 grammes	=	$30\frac{4}{5}$,,			
3 ,,	=	$46\frac{1}{5}$,,			
4 ,,	=	$61\frac{3}{5}$,,	.... or	1 drachm	$1\frac{3}{5}$ grain.
5 ,,	=	77 ,,	.... ,,	1 ,,	17 grains.
6 ,,	=	$92\frac{2}{5}$,,	.... ,,	1 ,,	$32\frac{2}{5}$,,
7 ,,	=	$107\frac{4}{5}$,,	.... ,,	1 ,,	$47\frac{4}{5}$,,
8 ,,	=	$123\frac{1}{5}$,,	.... ,,	2 drachms	$3\frac{1}{5}$,,
9 ,,	=	$138\frac{3}{5}$,,	.... ,,	2 ,,	$18\frac{3}{5}$,,
10 ,,	=	154 ,,	.... ,,	2 ,,	34 ,,
11 ,,	=	$169\frac{2}{5}$,,	.... ,,	2 ,,	$49\frac{2}{5}$,,
12 ,,	=	$184\frac{4}{5}$,,	.... ,,	3 ,,	$4\frac{4}{5}$,,
13 ,,	=	$200\frac{1}{5}$,,	.... ,,	3 ,,	$20\frac{1}{5}$,,
14 ,,	=	$215\frac{3}{5}$,,	.... ,,	3 ,,	$35\frac{3}{5}$,,
15 ,,	=	231 ,,	.... ,,	3 ,,	51 ,,
16 ,,	=	$246\frac{2}{5}$,,	.... ,,	4 ,,	$6\frac{2}{5}$,,
17 ,,	=	$261\frac{4}{5}$,,	.... ,,	4 ,,	$21\frac{4}{5}$,,
18 ,,	=	$277\frac{1}{5}$,,	.... ,,	4 ,,	$37\frac{1}{5}$,
19 ,,	=	$292\frac{3}{5}$,,	.... ,,	4 ,,	$52\frac{3}{5}$,,
20 ,,	=	308 ,,	.... ,,	5 ,,	8 ,,
30 ,,	=	462 ,,	.... ,,	7 ,,	42 ,,
40 ,,	=	616 ,,	.... ,,	10 ,,	16 ,,
50 ,,	=	770 ,,	.... ,,	12 ,,	50 ,,
60 ,,	=	924 ,,	.... ,,	15 ,,	24 ,,
70 ,,	=	1078 ,,	.... ,,	17 ,,	58 ,,
80 ,,	=	1232 ,,	.... ,,	20 ,,	32 ,,
90 ,,	=	1386 ,,	.... ,,	23 ,,	6 ,,
100 ,,	=	1540 ,,	.... ,,	25 ,,	40 ,,

DEVELOPING VALUE OF THE ALKALIES.

Mr. W. B. Bolton's Table.

Caustic Soda.	Caustic Potash.	Ammonia NH_3.	Carbonate of Soda (anhydrous).	Carbonate of Soda (cryst.).	Carbonate of Potash (anhydrous).	Carbonate of Potash (cryst.).	Sesquicarbonate of Ammonia.
1	1·400	0·425	2·650	7·150	3·450	4·350	7·250
0·714	1·	0·304	1·893	5·170	2·464	3·107	5·178
2·353	3·294	1·	6·235	16·823	8·117	10·235	17 057
0·377	0·528	0·160	1·	2·698	1·301	1·641	2·736
0·140	0·196	0·059	0·370	1·	0·482	0·608	1·014
0·290	0·405	0·123	0·768	2·072	1·	1·261	2·101
0·230	0·322	0·098	0·609	1·644	0·793	1·	1·666
0·138	0·193	0·059	0·365	0·986	0·476	0·600	1·

CHEMICAL EQUIVALENCE OF THE ALKALIES.

Mr. G. E. Brown's Table.

Caustic Soda.	Caustic Potash.	Ammonia (·880 solution).	Carbonate of Soda (anhydrous).	Carbonate of Soda (cryst.).	Carbonate of Potash (anhydrous).	Carbonate of Potash (cryst.).	Sesquicarbonate of Ammonia.
80	112	97·14	106	286	138	174	12
1	1·400	·867	1·325	3·575	1·725	2·174	1·587
·714	*1*	1·211	·946	2·553	1·232	1·554	1·134
·834	1·153	*1*	1·091	2·944	1·421	1·791	1·307
·755	1·033	·916	*1*	2·698	1·302	1·641	1·198
·280	·392	·340	·371	*1*	·483	·608	·444
·580	·812	·704	·768	2·072	*1*	1·260	·920
·460	·644	·558	·609	1·644	·793	*1*	·730
·630	·882	·765	·835	2·252	1·087	1·370	*1*

DENSITY OF AQUEOUS SOLUTION OF AMMONIA AT 15°.

(Lunge and Wiernik.

Specific Gravity.	NH_3 per Cent.	1 Litre contains NH g.	Correction of Sp. Gr. for ± 1
1·000	0·00	0·1	0·00018
0·898	0·45	4·5	0·00018
0·996	0·91	9·1	0·00019
0·994	1·37	13·6	0·00019
0·992	1·84	18·2	0·00020
0·990	2·31	22·9	0·00020
0·988	2·80	27·7	0·00021
0·986	3·30	32·5	0·00021
0·984	3·80	37·4	0·00022
0·982	4·30	42·2	0·00022
0·980	4·80	47·0	0·00023
0·978	5·30	51·8	0·00023
0·976	5·80	56·6	0·00024
0·974	6·30	61·4	0·00024
0·972	6·80	66·1	0·00025
0·970	7·31	70·9	0·00025
0·968	7·82	75·7	0·00026
0·966	8·33	80·5	0·00026
0·964	8·84	85·2	0·00027
0·962	9·35	89·9	0·00028
0·960	9·91	95·1	0·00029
0·958	10·47	100·3	0·00030
0·956	11·03	105·4	0·00031
0·954	11·60	110·7	0·00032
0·952	12·17	115·9	0·00033
0·950	12·74	121·0	0·00034
0·948	13·31	126·2	0·00035
0·946	13·18	131·3	0·00036
0·944	14·46	136·5	0·00037
0·942	15·04	141·7	0·00038

To Reduce Over-printed Proofs.—Immerse the prints in a solution composed of five grains of cyanide of potassium and five drops of liquor ammonia to a pint of water. Allow them to remain until a sufficient degree of reduction has been effected and then wash carefully.

To Blacken the Brass Work of Lenses.—The diaphragms of lenses ought not to be blackened by the dead-black varnish which is employed on the cells and the inside of a tube, as it would invariably chip off and produce a worse effect than if left untouched. They ought to be stained, by being first made quite clean and then receiving an application of a solution of nitrate of silver and nitrate of copper, heat being then applied,

DENSITY OF AQUEOUS SOLUTION OF AMMONIA AT 15°.—*Continued.*

(LUNGE AND WIERNIK.)

Specific Gravity.	NH_3 per Cent.	1 Litre contains NH_3 g.	Correction of Sp. Gr. for ± 1°.
0·940	15·63	146·9	0·00039
0·938	16·22	152·1	0·00040
0·936	16·82	157·4	0·00041
0·934	17·42	162·7	0·00041
0·932	18·03	168·1	0·00042
0·930	18·64	173·4	0·00042
0·928	19·25	178·6	0·00043
0·926	19·87	184·2	0·00044
0·924	20·49	189·3	0·00045
0·922	21·12	194·7	0·00046
0·920	21·75	200·1	0·00047
0·918	22·39	205·6	0·00048
0·916	22·03	210·9	0·00049
0·914	23·68	216·3	0·00050
0·912	24·33	221·9	0·00051
0·910	24·99	227·4	0·00052
0·908	25·65	232·9	0·00053
0·906	26·31	238·3	0·00054
0·904	26·98	243·9	0·00055
0·902	27·65	249·4	0·00056
0·900	28·33	255·0	0·00057
0·898	29·01	260·5	0·00058
0·896	29·69	266·0	0 00059
0·894	30·37	271·5	0·00060
0·892	31·05	277·0	0·00060
0·890	31·75	282·6	0·00061
0·888	32·50	288·6	0·00062
0·886	33·25	294·6	0·00063
0·884	34·10	301·4	0·00064
0·882	34·95	308·3	0·00065

TO PREPARE AN ILLUSTRATION FOR THE LANTERN.—A lecturer may prepare a diagram in a few minutes by coating thin glass or mica with benzole varnish to which a few drops of indiarubber solution have been added. This dries transparent, but allows of the finest writing being made on it by means of a steel pen and India ink. By placing it upon an engraving, the leading features may be quickly and accurately traced in outline.

TO MAKE INK FOR LABELS THAT WILL NOT BE AFFECTED BY ACIDS.—Make a mixture of one part pure Trinidad asphaltum, with four parts of oil of turpentine, coloured with plumbago.

TABLES FOR THE SIMPLIFICATION OF EMULSION CALCULATIONS.

WITH a view of simplifying the calculations involved in emulsion-making, the late Mr. William Ackland a few years ago worked out some useful tables, which will enable even those most ignorant of chemical philosophy to calculate with ease and rapidity the proper quantities of silver or haloid salts in any formula. Even those who are able to perform the calculations in the recognised style will find their labours materially lightened by means of these tables, which should be kept in a convenient place for reference in every laboratory.

No. I.

	Equivalent weights.	Weight of $AgNO_3$ required to convert one grain of soluble haloid.	Weight of soluble haloid required to convert one grain $AgNO_3$.	Weight of *silver* haloid produced by one grain of *soluble* haloid.	Weight of *soluble* haloid required to produce one grain of *silver* haloid.	Weight of silver haloid produced from one grain $AgNO_3$.
Ammonium bromide	98	1·734	·576	1·918	·521	1·106
Potassium ,, ...	119·1	1·427	·700	1·578	·633	
Sodium ,, ...	103	1·650	·606	1·825	·548	
Cadmium ,, com.	172	·988	1·012	1·093	·915	
,, ,, anh.	136	1·25	·800	1·382	·723	
Zinc ,, ...	112·1	1·509	·663	1·670	·600	
Ammonium chloride	53·5	3·177	·315	2·682	·373	·844
Sodium ,, ...	58·5	2·906	·344	2·458	·408	
Ammonium iodide	145	1·172	·853	1·620	·617	1·382
Potassium ,, ...	166·1	1·023	·977	1·415	·707	
Sodium ,, ...	150	1·133	·882	1·566	·638	
Cadmium ,, ...	183	·929	1·076	1·284	·778	

The principal bromides, chlorides, and iodides which are likely to be used in emulsions of either gelatine or collodion have been included in these tables. Table No. I. presents to the reader, without any mystification which may be involved in equivalents, the actual weights of haloid or silver, as the case may be, required to convert or combine with one grain of the other.

In order to test the utility of this table, let us suppose that it is desired to make (say) ten ounces of emulsion by a new formula, which, for the sake of showing the working of the table, we will write down as follows :—

Bromide of potassium	150	grains.
Iodide of potassium	10	,,
Chloride of ammonium	10	,,
Gelatine	200	,,

Now we want to know how much silver nitrate should be employed in sensitising this mixture. For this purpose we use the first column, in which we find against each haloid the exact quantity of silver nitrate required to fully decompose one grain. Taking, then, the figures we find in column No. 1 against the three salts in the above formula, and multiplying them by the number of grains of each used, we have the following sum :—

Potassium bromide	$150 \times 1{\cdot}427 = 214$	Weight silver nitrate required,
,, iodide	$10 \times 1{\cdot}023 = 10{\cdot}23$	
Chloride of ammonium ...	$10 \times 3{\cdot}177 = 31{\cdot}77$	

or the total quantity of silver nitrate required for full conversion, 256·00 grains.

No. II.

	Ammonium Bromide.	Potassium Bromide.	Sodium Bromide.	Cadmium Bromide. (Coml.)	Cadmium Bromide. (Anhyd.)	Zinc Bromide.	Ammonium Chloride.	Sodium Chloride.	Ammonium Iodide.	Potassium Iodide.	Sodium Iodide.	Cadmium Iodide.
Ammonium bromide............	**1**	·823	·951	·57	·72	·87	1·832	1·675	·676	·59	·653	·535
Potassium ,, ...	1·215	**1**	1·156	·692	·876	1·058	2·226	2·036	·821	·717	·794	·651
Sodium ,, ...	1·051	·865	**1**	·599	·757	·915	1.925	1·761	·71	·62	·686	·563
Cadmium ,, com.	1·755	1·444	1·67	**1**	1·265	1·527	3·215	2·94	1·186	1·035	1·146	·94
,, ,, anh.	1·387	1·141	1·32	·79	**1**	1·207	2·542	2·324	·938	·819	·906	·743
Zinc ,, ...	1·149	·945	1·093	·655	·828	**1**	2·104	1·925	·776	·678	·75	·615
Ammonium chloride............	·546	·449	·519	·311	·393	·475	**1**	·914	·369	·322	·356	·292
Sodium ,, ...	·597	·491	·568	·34	·43	·519	1·093	**1**	·403	·352	·39	·319
Ammonium iodide..............	1·479	1·217	1·408	·843	1·066	1·287	2·712	2·478	**1**	·873	·966	·792
Potassium ,, ...	1·695	1·394	1·612	·965	1·221	1·475	3·104	2·839	1·145	**1**	1·107	·907
Sodium ,, ...	1·53	1·259	1·456	·872	1·103	1·332	2·803	2·564	1·034	·903	**1**	·819
Cadmium ,, ...	1·867	1·536	1·776	1·064	1·345	1·625	3·42	3·128	1·262	1·102	1·22	**1**

TABLE No. II. gives in separate columns the relative converting values of each of the soluble haloid salts in ordinary use, showing how much of any salt must be used to replace one grain of any other. In each column will be found a unit (printed in larger type) which represents one grain of the salt named at the head of the column; the other figures in the same column show the exact quantities of the other salts which must be used in lieu of a single grain of that particular haloid. Thus, taking the first column, which is headed 'Ammonium Bromide,' we find against ammonium bromide in the margin the figure 1, representing one grain of that salt. If we wish to know the relative converting power of potassium bromide we take the number in the same column which stands against the latter salt in the margin, viz., 1·215; that is to say, 1·215 grain of potassium bromide will be required to do the same work as one of NH_4 Br.

SOLUBILITY OF THE SILVER HALOIDS.

By E. Valenta.

In the *Royal Photographic Society's Journal* the following table, the result of a series of experiments, is given.

Solvent.	Concentration.	100 g. of solution can dissolve in grammes.			Remarks.
		Ag Cl.	Ag Br.	Ag I.	
Sodium hyposulphite	1 : 100	0·40	0·35	0·03	
"	5 : 100	2·00	1·90	0·15	
"	10 : 100	4·10	3·50	0·30	The estimations were made at 20° C.
"	15 : 100	5·50	4·20	0·40	
"	20 : 100	6·10	5·80	0·60	
Ammonium hyposulphite	1 : 100	0·57	—	—	For bromide and iodide of silver
"	5 : 100	1·32	—	—	similar results were obtained as
"	10 : 100	3·92	—	—	with sodium hyposulphite.
Sodium sulphite	10 : 100	0·44	0·04	0·01	
"	20 : 100	0·95	0·08	0·02	
Ammonium sulphite	10 : 100		traces		
Ammonium carbonate	10 : 100	0·05	—	—	
Ammonia	3 %	1·40	—	—	
"	15 %	7·58	—	—	
Magnesium chloride	50 : 100	0·50	—	—	
Potassium cyanide	5 : 100	2·75	6·55	8·23	25° C.
Ammonium sulphocyanide	5 : 100	0·08	0 21	0·02	
"	10 : 100	0·54	2·04	0·08	23° C.
"	15 : 100	2·88	5·30	0·13	
Potassium sulphocyanide	10 : 100	0·11	0·73	—	25° C.
Calcium sulphocyanide	10 : 100	0·15	0·53	0·03	
Barium sulphocyanide	10 : 100	0·20	0·35	0·02	
Aluminium sulphocyanide	10 : 100	2·02	4·50	0·02	
Thiocarbamide	10 : 100	0·83	1·87	0·79	25° C.
Thiosinamin	1 : 100	0·40	0·08	0·008	
"	5 : 100	1·90	0·35	0·05	
"	10 : 100	3·90	0·72	0·09	

TABLE OF THE SYMBOLS, ATOMIC AND EQUIVALENT WEIGHTS OF THE ELEMENTS.

Name.	Symbol.	Atomic Weight.	Equivalent Weight.
Aluminium	Al	27·02	9·007
Antimony	Sb	120·	40·
Arsenic	As	74·9	24·97
Barium	Ba	136·8	68·4
Beryllium	Be	9·08	4·54
Bismuth	Bi	208·	69·33
Boron	B	10·9	3·66
Bromine	Br	79·75	79·75
Cadmium	Cd	112·	56·
Cæsium	Cs	133·	132·7
Calcium	Ca	39·9	19·95
Carbon	C	11·97	2·99
Cerium	Ce	139·9	46·6
Chlorine	Cl	35·37	35·37
Chromium	Cr	52·4	26·2
Cobalt	Co	59·	29·5
Copper	Cu	63·2	31·6
Didymium	Di	143·	47·8
Erbium	E	165·9	55·3
Fluorine	F	19·1	19·1
Gallium	Ga	69·	23·
Gold	Au	197·	65·66
Hydrogen	H	1·	1·
Indium	In	113·4	37·8
Iodine	I	126·53	126·53
Iridium	Ir	192·5	48·125
Iron	Fe	55·9	27·95
Lanthanum	La	138·5	46·17
Lead	Pb	206·4	103·2
Lithium	Li	7·01	7·01
Magnesium	Mg	24·	12·
Manganese	Mn	55·	27·5
Mercury	Hg	199·8	99·9
Molybdenum	Mo	95·8	19·16
Nickel	Ni	58·6	29·3
Niobium	Nb	94·	31·33
Nitrogen	N	14·01	4·67
Osmium	Os	193·	24·125
Oxygen	O	15·96	7·98
Palladium	Pd	106·2	26·55
Phosphorus	P	30·96	10·32
Platinum	Pt	194·3	48·575

TABLE OF SYMBOLS, &c.—Continued.

Name.	Symbol.	Atomic Weight.	Equivalent Weight.
Potassium	K	39·04	39·04
Rhodium	Ro	104·	26·
Rubidium	Rb	85·2	85·2
Ruthenium	Ru	104·4	26·1
Selenium	Se	78·8	39·4
Silicon	Si	28·3	7·
Silver	Ag	107·66	107·66
Sodium	Na	23·	23·
Strontium	Sr	87·3	43·65
Sulphur	S	31·98	15·99
Tantalum	Ta	182·	60·67
Tellurium	Te	125·	62·5
Thallium	Tl	203·64	203·64
Thorium	Th	231·87	57·97
Tin	Sn	117·8	58·9
Titanium	Ti	48·0	12·
Tungsten	W	183·6	30·6
Uranium	U	240·	60·
Vanadium	V	51·2	17·07
Yttrium	Y	89·6	29·87
Zinc	Zn	65·2	32·6
Zirconium	Zr	90·	45·

FREEZING MIXTURES.

The following mixtures will be found useful where ice is not readily obtainable—

	Ingredients.	Parts by Weight.	The Temperature at starting being 50° Fahr. the thermometer sinks.	Diminution of Temperature.
1	Water Nitrate of ammonia	1 1	From + 50° to + 4°	46° Fahr.
2	Water Saltpetre Chloride of ammonium (sal ammoniac)	16 5 5	„ + 50° „ + 10°	40° „
3	Water Nitrate of ammonia Carbonate of soda	1 1 1	„ + 50° „ + 7°	43° „
4	Snow Chloride of sodium	2 1	„ 32° „ − 5°	37° „
5	Snow Crystallised chloride of calcium	2 3	„ + 32° „ − 50°	82° „
	Crystallised sulphate of soda Hydrochloric acid	8 5	„ + 50° „ 0°	50° „

TABLE OF SYMBOLS OF THE MORE IMPORTANT COMPOUNDS USED IN PHOTOGRAPHY.

NAME.	SYMBOL.	
Acid, Acetic (Cryst.)	$H, C_2 H_3 O_2$	60
,, Citric	$H_3, C_6 H_5 O_7 + H_2 O$	210
,, Formic	H, CHO_2	46
,, Gallic	$H, C_7 H_5 O_5$	170
,, Hydriodic	HI	128
,, Hydrobromic	$H Br$	81
,, Hydrochloric	$H Cl$	36·5
,, Hydrocyanic	$H CN$	27
,, Hydrosulphuric	$H_2 S$	34
,, Nitric	H, NO_3	63
,, Oxalic	$H_2 C_2 O_4 + 2 H_2 O$	126
,, Pyrogallic	$H_3 C_6 H_3 O_3$	126
,, Sulphuric	$H_2 SO_4$	98
,, Sulphurous	$H_2 SO_3$	82
,, Tannic	$H_4 C_{27} H_{18} O_{17}$	618
,, Tartaric	$H_4 C_4 H_2 O_6$	150
Alcohol, Methyl	$CH_4 O$	32
Alum, Chrome	$Cr K (SO_4)_2 12 H_2 O$	499·3
,, (Potash)	$Al K (SO_4)_2 12 H_2 O$	474·5
Amidol	$C_6 H_8 N_2 O$	17
Ammonium, Bichromate	$(NH_4)_2 Cr_2 O_7$	252
,, Bromide	$NH_4 Br$	98
,, Carbonate	$(NH_4)_2 CO_3$	96
,, Chloride	$NH_4 Cl$	53·5
,, Iodide	$NH_4 I$	145
,, Nitrate	NH_4, NO_3	80
,, Oxalate	$(NH_4)_2 C_2 O_4$	124
,, Sulphide of	NH_4, HS	51
,, Sulphocyanide of	NH_4, CNS	76
Barium, Bromide	$Ba Br_2$	297
,, Chloride (Cryst.)	$Ba, Cl_2 + 2 H_2 O$	244
,, Iodide	$Ba I_2$	391
,, Nitrate	$Ba, (NO_3)_2$	261
Benzole	$C_6 H_6$	78
Boracic Acid	$H_3 BO_3$	62
Cadmium, Bromide (Cryst.)	$Cd, Br_2 + 4 H_2 O$	344
,, Chloride	$Cd Cl_2$	183
,, Iodide	$Cd I_2$	366
Calcium, Bromide (Cryst.)	$Ca Br_2 + 4 H_2 O$	272
,, Chloride	$Ca Cl_2$	111
,, Iodide	$Ca I_2$	294
Camphor	$C_{10} H_{16} O$	152
Carbolic Acid	$C_6 H_6 O$	94
Copper, Bromide (cupric)	$Cu Br_2$	223·4
,, Chloride ,,	$Cu Cl_2 2 H_2 O$	170·4
,, Sulphate ,,	$Cu SO_4 5 H_2 O$	249·4

TABLES OF SYMBOLS, &c.—Continued.

Name.	Symbol.	
Dextrine	$C_6 H_{10} O_5$	162
Eikonogen	$C_6 H_{10} O_5$	261
Gold, Terchloride	$Au Cl_3$	302·5
Hydroquinone	$C_6 H_6 O_2$	110
Iridium, Perchloride	$Ir Cl_4$	335
Iron, Chloride (ferrous)	$Fe Cl_2$	127
,, ,, (ferric)	$Fe_2 Cl_6$	325
,, Citrate	$Fe_2 (C_6 H_5 O_7)_2$	598
,, Iodide	$Fe I_2$	310
,, Oxalate (ferrous)	$Fe C_2 O_4$	144
,, ,, (ferric)	$Fe_2 (C_2 O_4)_3$	376
,, Sulphate (ferrous)	$Fe SO_4 + 7 H_2 O$	278
,, ,, (ferric)	$Fe_2 (SO_4)_3$	400
,, Ammonia-sulphate	$Fe SO_4, (NH_4)_2 SO_4 + 6 H_2 O$	392
Kaolin	$H_2 Al_2 Si_2 O_8 + H_2 O$	258·8
Lead, Acetate (Cryst.)	$Pb, (C_2 H_3 O_2)_2 + H_2 O$	343
,, Nitrate	$Pb, (NO_3)_2$	331
Lithium, Bromide	$Li Br$	87
,, Chloride	$Li Cl$	42·5
,, Iodide	$Li I$	134
Magnesium, Bromide	$Mg Br_2$	184
,, Chloride	$Mg Cl_2$	95
,, Iodide	$Mg I_2$	278
Mercury, Chloride (Mercuric)	$Hg Cl_2$	271
Metol	$C_8 H_{11} NO$	137
Nitrous Acid	$H NO_2$	63
Para-amidophenol	$C_6 H_7 NO$	109
Platinum, Chloride	$Pt Cl_4$	339·4
Potassium, Acetate	$K C_2 H_3 O_2$	98·1
,, Bichromate	$K_2 Cr_2 O_7$	294·6
,, Bromide	$K Br$	119·1
,, Carbonate	$K_2 CO_3$	138·2
,, Chloride	$K Cl$	74·6
,, Citrate	$K_3 C_6 H_5 O_7 + H_2 O$	324·3
,, Cyanide	$K C N$	65·1
,, Ferridcyanide	$K_6 Fe_2 Cy_{12}$	658·6
,, Ferrocyanide	$K_4 Fe Cy_6$	368·4
,, Hydrate	$K OH$	56·1
,, Iodide	$K I$	166·1
,, Nitrate	$K NO_3$	101·1
,, Oxalate	$K C_2 O_4 H_2 O$	235
,, Permanganate	$K_2 Mn_2 O_8$	316·2
,, Sulphocyanide	$K Cy S$	97
Salicylic Acid	$C_7 H_6 O_3$	138
Silver, Acetate	$Ag C_2 H_3 O_2$	167
,, Bromide	$Ag Br$	188
,, Carbonate	$Ag_2 CO_3$	276

TABLES OF SYMBOLS, &c.—CONTINUED.

NAME.	SYMBOL.	
Silver, Chloride	$Ag\,Cl$	143·5
,, Citrate	$Ag_3\,C_6H_5O_7$	513
,, Fluoride	$Ag\,Fl$	127
,, Iodide	$Ag\,I$	235
,, Nitrate	$Ag\,NO_3$	170
,, Oxalate	$Ag_2\,C_2\,O_4$	304
,, Oxide	$Ag_2\,O$	232
,, Sulphide	$Ag_2\,S$	248
Sodium, Acetate (Cryst.)	$Na\,C_2\,H_3\,O_2\,3\,H_2\,O$	136
,, Biborate (Borax)	$Na_2\,B_4\,O_7 + 10\,H_2\,O$	382
,, Bicarbonate	$Na\,H\,C\,O$	84
,, Bromide	$Na\,Br$	103
,, Carbonate (Cryst.)	$Na_2\,CO_3 + 10\,H_2\,O$	286
,, Chloride	$Na\,Cl$	58·5
,, Citrate	$2\,(Na_3\,C_6\,H_5\,O_7)\,11\,H_2\,O$	714
,, Hydrate	$Na\,H\,O$	40
,, Hyposulphite (Cryst.)	$Na_2\,S_2\,O_3 + 5\,H_2\,O$	248
,, Iodide	$Na\,I$	150
,, Sulphite	$Na_2\,SO_3\,7\,H_2\,O$	252
Strontium, Bromide	$Sr\,Br_2$	247·5
,, Chloride	$Sr\,Cl_2$	158·5
,, Iodide	$Sr\,I_2$	341·5
Thymol	$C_6\,H_3\,(C\,H_3)\,(C_3\,H_7)\,C\,O\,O$	177
Tin, Chloride (stannous)	$Sn\,Cl_2\,2\,H_2\,O$	225
,, ,, Stannic	$Sn\,Cl_4$	260
Uranium, Bromide	$U\,Br_2\,4\,H_2\,O$	352
,, Nitrate	$U_2\,O_2\,(NO_3)_2\,6\,H_2\,O$	504
Zinc, Bromide	$Zn\,Br_2$	225·2
,, Chloride	$Zn\,Cl_2$	136·2
,, Iodide	$Zn\,I_2$	319·2

To Ascertain the Strength of a Silver Solution. — If the solution contain nothing but nitrate of silver, then may the argento-hydrometer be employed in the certainty of its affording a fairly accurate idea of the number of grains of the salt contained in each ounce of water. But this specific-gravity test quite fails in the case of a silver solution which, from having been long in use, contains other matters. In this case a test solution, composed of pure chloride of sodium eight and a half grains, dissolved in six ounces of distilled water, must be prepared. To use it, place one drachm of the bath solution in a two-ounce bottle, rinsing out the minim measure with a drachm of distilled water and adding to the other. Pour in the salt solution slowly and with occasional shaking until no further precipitate takes place. Having noted how many drachms it has taken to effect this end, multiply this number by four for the weight in grains of the nitrate of silver present in an ounce of the bath solution. If pure chloride of sodium be not procurable, commercial chloride of ammonia may be substituted, seven and three-quarter grains being dissolved in six ounces of water.

TABLE OF THE SOLUBILITIES OF THE PRINCIPAL SUBSTANCES USED IN PHOTOGRAPHY.

	One part is soluble in — parts of water.		100 parts of water dissolve at ordinary temperature.	Solubility in Alcohol.
	Cold.	Boiling.		
Acid, Boracic (Anhydrous) .	47·01	...	2·13	soluble
,, ,, (Cryst.)	25·66	3·0	3·9	sol. in 6 parts @ 60°
,, Citric	0·75	0·5	133·0	sol. in 1·15 pt. s. g. 820
,, Gallic.....................	100·0	3·0	1·0	soluble in 4 parts
,, Oxalic	15·5	1·0	6·47	insoluble
,, Pyrogallic	2·25	...	...	sol. in alc. and ether
,, Salicylic	87·2	vry sol	0·35	easily soluble
,, Succinic..................	5·0	2·2	20·0	soluble in 3 parts
,, Tannic	very	solubl	e	sol. in alc. and ether
,, Tartaric..................	·66	·5	150·0	soluble
Alum (Potash)	10·5	vry sol	9·52	insoluble
,, (Ammonia)	7·32	,,	13·66	,,
Amidol..........................	very	solubl	e	
Ammonium, Bromide	1·4	0·78	41·1	sol. in 32·3 parts
,, Carbonate ...	3·3	·833	33·0	insoluble
,, Chloride	2·7	1·00	37·02	sparingly soluble
,, Citrate	deliqu	escent	vy. sol.	less sol. in alcohol
,, Iodide	very	solubl	e	soluble
,, Nitrate	2·0	1·0	50·0	freely soluble
,, Oxalate.........	4·0	2·0	...	soluble
,, Salicylate	very	solubl	e	
,, Succinate	,,	,,		
,, Sulphocyanide	deliqu	escent	easily	sol. in water and alc.
Barium, Bromide	·96	...	104·2	easily soluble
,, Chloride { Crystallised	2·18	...	46·0	very slightly soluble
,, Chloride { Anhydrous.	2·862	...	34·1	
,, Iodide.....................	0·48	0·35	208·3	easily soluble
,, Nitrate	12·2	2·84	8·18	
Cadmium, Bromide	easily	solubl	e	easily soluble
,, Chloride	0·71	0·67	...	,,
,, Iodide	1·08	0·75	92·6	very soluble
Calcium, Bromide (Cryst.) .	0·97	...	102·56	easily soluble
,, Chloride	0·25	any qy	400·0	
,, Iodide	deliqu	escent		
Cobalt, Chloride....	very	solubl	e	sol. in alc. and ether
Copper, Bromide (Cupric)...	deliqu	escent	vy. sol.	,, ,,
,, Chloride ,, ...	,,	,,	,,	,, ,,
,, Nitrate	solubl	e	...	very soluble
,, Sulphate	2·5	...	40·0	insoluble
Eikonogen	40·0	vry sol	...	soluble
Gold, Perchloride	deliqu	escent	vy. sol.	soluble in ether

TABLE OF THE SOLUBILITIES, &c.—CONTINUED.

	One part is soluble in — parts of water. Cold.	Boiling.	100 parts of water dissolve at ordinary temperature.	Solubility in Alcohol.
Iron, Chloride (Ferrous) Anhyd. ...	2·0	...	50·0	sol. in 1 part alcohol
Iron, Chloride (Ferrous) Hydrated .	0·68	...	147·0	easily soluble
,, Chloride (Ferric)	very	del. &	sol.	very soluble
,, Oxalate ,, ...	insolu	ble, ex	cept in	excess of oxalic acid
,, Sulphate ,, ...	solubl	e	...	soluble
,, ,, (Ferrous) ...	1·3	·30	77·0	insoluble
Lead, Acetate	3·7	3·45	27·0	soluble in 12·5 parts
,, Nitrate	7·7	...	13·0	
Lithium, Bromide	0·66	...	149·8	soluble
,, Chloride	1·315	...	76·0	
,, Iodide	0·61	...	164·0	
Magnesium, Bromide	deliqu	escent	vy. sol.	very soluble
,, Chloride	1·857	...	53·8	
,, Iodide	deliqu	escent	vy. sol.	soluble
,, Sulphate	1·47	0·66	68·04	slightly soluble
Mercury, Chloride .... (Mercuric)	16·0	3·0	6·25	soluble in 2·35 parts
Platinum, Bichloride.........	solubl	e	...	easily sol. in alc. & ether
Potassium, Bichromate ...	10·0	...	10·0	
,, Bromide	1·55	...	64·5	
,, Carbonate	0·9	...	111·0	
,, Chloride	3·03	2·0	33·0	slightly soluble
,, Citrate	very	solubl	e	
,, Cyanide	deliqu	escent	vy. sol.	insol. in pure alcohol
,, Ferrocyanide ...	3·0	1·0	33·3	insoluble
,, Ferridcyanide...	2·54	1·22	39·37	very sparingly soluble
,, Hydrate	0·5	...	200·0	very soluble
,, Iodide	0·7	0·27	143·0	sol. in 40 pts. abs. alc.
,, Nitrate............	3·5	0·4	28·57	insoluble
,, Nitrite	deliqu	& solu	ble	
,, Oxalate(neutral)	3·0	...	33·3	slightly soluble
,, ,, (bin.) ...	40·0	...	2·5	insoluble
,, ,, (quad.)..	20·17	...	4·95	insoluble
,, Permanganate..	16·0	...	6·25	insoluble
,, Sulphocyanide..				
Silver, Acetate	very	slightl	y sol.	
,, Citrate..................	solubl	e in wa	rm wate	r
,, Fluoride	deliqu	escent		
,, Nitrate	1·0	0·5	100·0	sol. in 4 pts. boiling alc.
,, Nitrite	300·0	dissol. easily	0·33	insoluble
,, Oxalate	spar'ly sol.	solubl	e	insoluble

TABLE OF THE SOLUBILITIES, &c.—CONTINUED.

	One part is soluble in — parts of water. Cold.	Boiling.	100 parts of water dissolve at ordinary temperature.	Solubility in Alcohol.
Silver, Sulphate	200·0	88 0	0·5	insoluble
Sodium, Acetate (Cryst.)	2·86	·66	35·0	
,, Biborate (Borax)	12·44	2·0	8·033	insoluble
,, Bromide	1·13	...	88·5	
,, Carbonate (Cryst.)	2·0	1·0	50·0	insoluble
,, ,, (Anhyd.)	3·85	2·07	25·93	insoluble
,, Chloride	2·77	2·77	36·0	sparingly soluble
,, Citrate	1·0	...	100·0	sparingly soluble
,, Hydrate	1·65	...	60·63	easily soluble
,, Hyposulphite (Thiosulphate)	deliquescent		vy. sol.	insoluble
,, Iodide	0·55	0·3	180 0	sparingly soluble
,, Nitrate	1·136	...	88·03	sol. in 37 parts alc.
,, Nitrite	deliquescent		vy. sol.	very soluble
,, Phosphate	4·0	2·0	25·0	
,, Succinate	very soluble			
,, Sulphate	2·08	0·41	48·0	soluble
,, Sulphite	4·0	...	25·0	slightly soluble
,, Bisulphite	very soluble		...	insoluble
,, Sulphocyanide				
,, Tartrate	1·75	...	56·37	insoluble
,, Tungstate	4·0	2·0	25 0	
Strontium, Bromide	1·01	...	99·0	sparingly soluble
,, Chloride	1·88	...	53·0	feebly soluble
,, Iodide	0·56	0·27	178·5	
Uranium, Bromide (Hydrated)	deliqu & soluble			soluble
,, Nitrate	0·5	...	200·0	sol. in alc. and ether
,, Oxalate	nearly insol.	30·0	...	insoluble
Zinc, Bromide	deliquescent		vy. sol.	very soluble
,, Chloride	0·333	...	300·0	very soluble
,, Iodide	vy. deliques. & sol.			very soluble

Percentage of Real Ammonia in Solutions of different Densities at 14° Centigrade.—CARIUS.

Specific Gravity.	Percentage Ammonia.	Specific Gravity.	Percentage Ammonia.	Specific Gravity.	Percentage Ammonia.	Specific Gravity.	Percentage Ammonia.
0·8844	36·0	0·9052	27·0	0·9314	18·0	0·9631	9·0
0·8864	35·0	0·9078	26·0	0·9347	17·0	0·9670	8·0
0·8885	34·0	0·9106	25·0	0·9380	16·0	0·9709	7·0
0·8907	33 0	0·9133	24·0	0·9414	15·0	0·9749	6·0
0·8929	32·0	0·9162	23·0	0·9449	14·0	0·9790	5·0
0·8953	31·0	0·9191	22·0	0·9484	13 0	0·9831	4·0
0·8976	30 0	0·9221	21·0	0·9520	12·0	0·9873	3·0
0·9001	29·0	0·9251	20·0	0·9556	11·0	0·9915	2·0
0·9026	28 0	0·9283	19·0	0·9593	10·0	0·9959	1·0

THERMOMETRIC TABLES,

Showing the Assimilation of the Thermometers in Use throughout the World.

Celsius.	Réaumur.	Fahrenheit.	Celsius.	Réaumur.	Fahrenheit.
100	80·0	212·0	49	39·2	120·2
99	79·2	210·0	48	38·4	118·4
98	78·4	208·4	47	37·6	116·6
97	77·6	206·6	46	36·8	114·8
96	76·8	204·8	45	36·0	113·0
95	76·0	203·0	44	35·2	111·2
94	75·2	201·2	43	34·8	109·4
93	74·4	199·4	42	33·6	107·6
92	73·6	197·6	41	32·8	105·8
91	72·8	195·8	40	32·0	104·0
90	72·0	194·0	39	31·2	102·2
89	71·2	192·2	38	30·4	100·4
88	70·4	190·4	37	29·6	98·6
87	69·6	188·6	36	28·8	96·8
86	68·8	186·8	35	28·0	95·0
85	68·0	185·0	34	27·2	93·2
84	67·2	183·2	33	26·4	91·4
83	66·4	181·4	32	25·6	89·6
82	65·6	179·6	31	24·8	87·8
81	64·8	177·8	30	24·0	86·0
80	64·0	176·0	29	23·2	84·2
79	63·2	174·2	28	22·4	82·4
78	62·4	172·4	27	21·6	80·6
77	61·6	170·6	26	20·8	78·8
76	60·8	168·8	25	20·0	77·0
75	60·0	167·0	24	19·2	75·2
74	59·2	165·2	23	18·4	73·4
73	58·4	163·4	22	17·6	71·6
72	57·6	161·6	21	16·8	69·8
71	56·8	159·8	20	16·0	68·0
70	56·0	158·0	19	15·2	66·2
69	55·2	156·2	18	14·4	64·4
68	54·4	154·4	17	13·6	62·6
67	53·6	152·6	16	12·8	60·8
66	52·8	150·8	15	12·0	59·0
65	52·0	149·0	14	11·2	57·2
64	51·2	147·2	13	10·4	55·4
63	50·4	145·4	12	9·6	53·6
62	49·6	143·6	11	8·8	51·8
61	48·8	141·8	10	8·0	50·0
60	48·0	140·0	9	7·2	48·2
59	47·2	138·2	8	6·4	46·4
58	46·4	136·4	7	5·6	44·6
57	45·6	134·6	6	4·8	42·8
56	44·8	132·8	5	4·0	41·0
55	44·0	131·0	4	3·2	39·2
54	43·2	129·2	3	2·4	37·4
53	42·4	127·4	2	1·6	36·5
52	41·6	125·6	1	0·8	33·8
51	40·8	123·8	0	0·0	32·0
50	40·0	122·0			

TABLE SHOWING THE HOURLY VARIATION IN THE SUN'S POSITION

CALCULATED BY

Mean Time		A.M. 5	6	7	8	9	10	11
Jan. 1						41°E.	29°E.	16°E.
Feb. 1					59°E.	47	35	19
,, 20					63	50	36	20
Mar. 8				77°E.	65	52	37	21
,, 21				80	67	53	38	22
April 2			94° E.	82	69	55	40	21
,, 19		108°E.	97	85	72	58	41	21
May 8	4 A.M.	111	100	89	76	61	44	22
,, 27	125°E.	114	103	91	79	65	47	26
June 22	127°E.	116	106	95	82	68	51	28
July 18		115	104	93	81	67	51	29
Aug. 5		114	101	91	78	62	47	27
,, 25			97	85	73	59	43	23
Sept. 10			92	80	67	54	38	19
,, 23			88	77	64	50	35	17
Oct. 6				73	60	46	31	15
,, 22				69	57	44	29	12
Nov. 9					53	40	27	11
,, 22					52	39	25	11
Dec. 22						40	27	15

Calculated for latitude 52° N.

TO DEPOSIT GOLD UPON STEEL.—Make a solution of chloride of gold, the strength being immaterial, provided it be not too weak. We have always preferred having as little water as possible. Into this solution pour sulphuric ether, and, having replaced the stopper of the bottle, shake the mixture well up, when it will be found that the gold has left the water and entered into combination with the ether. Upon immersing a piece of bright polished steel—such as the blade of a knife—in this, it will instantly become coated with metallic gold.

IN DEGREES FROM THE SOUTH, AT DIFFERENT SEASONS OF THE YEAR.
J. A. C. BRANFILL.

	P.M.							
Noon	1	2	3	4	5	6	7	8
1° E.	13° W.	27° W.	40° W.					
4	12	27	40	53° W.				
4	13	29	44	57				
4	15	31	46	61	73° W.			
3	17	34	49	64	77	89° W.		
1	20	39	54	69	81	92		
1° W.	22	42	58	73	85	97	108° W.	
2	26	46	63	77	90	102	113	
1° W.	27	49	67	80	93	104	114	126° W.*
1° E.	27	49	67	81	94	105	115	127° W
2	23	46	64	79	91	102	113	125
2	22	44	61	75	88	100	111	
1	21	41	58	72	85	97	108*	
1° W.	21	39	55	69	82	94		
3	21	38	53	67	79			
4	21	37	52	65	77			
	20	36	50	63				
5	19	34	47	59				
4	19	33	45					
1° W.	15	28	41					

N.B.—Bearings marked * are taken when the sun is below the horizon.

TO PREPARE OX-GALL FOR ARTISTIC OR SCIENTIFIC PURPOSES. — Procure from a butcher half a pint of ox-gall. Place this in a clean saucepan and add an ounce of powdered alum and an ounce of common salt. Place over the fire, and when it boils remove for half an hour to cool; then boil again, and repeat this boiling and cooling for three or four times. After this allow it to settle for three or four hours, and decant off into a bottle, in which put two or three drops of essence of lemon. Cork and preserve for use.

UNIVERSAL EXPOSURE TABLE.

By F. B. Taylor.

Exposure = A × B × C × D × E seconds.

Intermediate factors 3/8, 3/4, 3/2, 3, 6 for **f/10, f/14, f/20,** &c.

Factor.	A. Subject and Distance to Shadows.	B. Stop.	C. Light.	D. Altitude of Sun.	E. Plate.
$\frac{1}{16}$	Clouds or distant mountains. **over ¼ mile.**	f/4	Expose for the shadows. *Less* exposure is required at high elevations, *e.g.* 5000 feet above sea level; and variations may be indicated by the colour of buildings or foliage, or lighting of interiors.		
$\frac{1}{8}$	Sea coast with sky or ships. **¼ mile.**	f/5·6			
$\frac{1}{4}$	Open landscape, or distant view. No near foreground. **100 yards.**	f/8	Angle of view when p/f = ·5, 1, 1·5, 2. is 28°, 53°, 74°, 90° Diff. for ·1, 6°, 5°, 4°, 3°.		**25 War.** Extra rapid: Drop shutter.
$\frac{1}{2}$	Landscape with trees. **100 feet.**	f/11	Full sun light.	**90° to 80°**	**22 23 W.** Rapid: 60 times.
1	View with near buildings or trees. **40 feet.**	f/16	Bright diffused light.	**70° to 54°**	**20 W.** Instantaneous 30 times.
2	Dark foliage in close foreground: Buildings in shade. **20 feet.**	f/22	Dull light.	**36° to 27°**	**17-18 W.** Ordinary: 15 times.
4	Portrait out of doors: Copying same size. **10 feet.**	f/32	Very gloomy.	**18° to 14°**	**15 W.** Slow. 10 times. wet.
8	Under trees. Indoor portrait near large window.	f/45	Slight fog.	**9° to 7°**	F. B. T. June, 1895.

For **portraits** in ordinary rooms × by **16**: For **interiors** read B × C × D × E in **minutes**; reduce if well lighted or extensive.

For **enlargements or reductions n** times × by (**n** + 1)². Distance of lens from plate = (**n** + 1) **f** = **n** times distance of lens from original.

Index of definition **ad** = **3f²**, which is constant for each lens; stop **f/a.**
Focus on object at d yards, all beyond **d/2** yards is in focus.
Focus on distant object, all beyond **d** yards is in focus.

FORM OF NOTE-BOOK

No.	Lens.	A. Subject. ¶ A, 40 ft. B, f/16. C, Bright, diffused. D, Sun 70°—54°. E, 20 W or 30 times. **Exposure 1 × 1 × 1 × 1 × 1 = 1 Sec.**	B. Stop.	C. Light.
	in.		f/	
	in.		f/	

North 53 40 0 23	June 21.	May 22. July 22.	Apr. 21. Aug. 21.	Mar. 22. Sept. 21.	Feb. 20. Oct. 21.	Jan. 20. Nov. 21.	Dec. 21.	North 53 40 0 23
12 Noon	60 73 67 90	57 70 70 87	49 62 78 79	37 50 90 67	25 38 78 55	17 30 70 47	14 27 67 44	12 Noon.
11 A. M. 1 P. M.	58 69 62 76	54 65 65 75	46 58 70 71	35 47 75 62	23 35 70 52	15 27 65 43	13 24 62 41	11 A. M. 1 P. M.
10 A. M. 2 P. M.	52 60 52 63	49 57 54 62	41 50 57 59	31 41 60 52	20 30 57 44	12 23 54 37	9 20 52 34	10 A. M. 2 P. M.
9 A. M. 3 P. M.	45 49 40 49	41 46 41 48	35 41 43 45	24 32 45 40	14 23 43 33	7 16 41 28	4 14 40 25	9 A. M. 3 P. M.
8 A. M. 4 P. M.	37 38 27 36	33 35 27 34	27 30 28 31	17 22 30 27	7 13 28 21	0 8 27 17	. 5 27 15	8 A. M. 4 P. M.
7 A. M. 5 P. M.	27 26 14 22	24 24 14 21	18 19 14 17	9 11 15 13	. 3 14 7	. . 14 4	. . 14 3	7 A. M. 5 P. M.
6 A. M. 6 P. M.	18 15 0 7	15 12 0 6	8 7 0 3	0 0 0 0	. . 0 .	. . 0 .	. . 0 .	6 A. M. 6 P. M.
5 A. M. 7 P. M.	10 4 . .	7 2 . .	Speed of plates.					
4 A. M. 8 P. M.	2 . . .							
South 53 40 0 23	Dec. 21.	Nov. 21. Jan. 20.	Oct. 21. Feb. 20	Sept. 21 Mar. 22.	Aug. 21. Apr. 21.	July 22. May 22.	June 21.	South 53 40 0 23

FOR USE WITH ABOVE.

D. Date, Hour, Sun's Alt.	E. Plate.	Factors.					Exposure.		Remarks.
		A.	B.	C.	D.	E.	Due.	True.	
: : ; m.	W.								Developer.
: : ; m.	W.								Developer.
: :									Developer.

COLONEL STUART WORTLEY'S EXPOSURE TABLE.

The following is an extract from an article, in a former Almanac, by the late Colonel Stuart Wortley:—

'I took the opportunity during my voyage into distant lands to make some careful tests of the different quality of the light in various places. These tests were made with two different kinds of actinometers, as well as by a special set of dry films made for the purpose, in order that I might compare the actual working of a plate with the scientific test of actinometry.

'I did not find that the light was so greatly superior in foreign countries as is generally supposed; and, putting the light of a very fine English day as 750, I found the power of light in various places to be as follows:—

At sea, 28 S. Pacific Ocean	1000
,, 42 S. Atlantic Ocean	970
Tahiti, in early morning	950
At sea, 16 S. Pacific Ocean	950
,, 21 N. ,,	900
In San Francisco harbour	870
On Rocky Mountains	850
Summit of Sierra Nevada	820
Virginia, Southern States of America	800
Sidney, Australia	800
Melbourne, ,,	800
Niagara Falls	780
England	750

'I will not trouble you with the light, that was worse than a good English day, beyond saying that the light at the Equator was comparatively poor in quality, though apparently very brilliant.'

RELATIVE EXPOSURES FOR VARYING PROPORTIONS OF IMAGE TO THE ORIGINAL.

[The following paper was read before the Royal Photographic Society by Mr. W. E. Debenham. Its usefulness would be diminished by abbreviation, hence we reproduce it in full.—Ed.]

When an enlarged photograph has to be made, either from a negative or print, it is commonly understood that the greater the degree of enlargement the longer will be the exposure required, but I have generally found only the vaguest ideas to exist as to the amount by which such exposure has to be prolonged. Sometimes, indeed, it is assumed that the exposure will be in direct inverse proportion to the area covered, so that a copy of twice the linear dimensions of the original—covering, as it does, the area of four times the size—would require an exposure of four times that sufficing for a copy of the same size. This calculation, however, omits to recognise an important factor, and leads to serious error; the actual exposure required in the case mentioned (assuming the same lens and stop to be used) being not four times, but two and a quarter times, that of a copy of same size; whilst, when we come to high degrees of enlargement, the error would amount to an indication of nearly four times the exposure actually required.

To find the relative exposure, add one to the number of times that the length of the original is contained in the length of the image, and square the sum. This will give the figure found in the third column of the annexed table.

Proportion of image to original (linear).	Distance of image from lens * in terms of principal focus.	Proportionate exposures.	Exposures proportioned to that required for copying same size.
$\frac{1}{30}$	$1\frac{1}{30}$	1·07	·27
$\frac{1}{20}$	$1\frac{1}{20}$	1·10	·28
$\frac{1}{10}$	$1\frac{1}{10}$	1·21	·3
$\frac{1}{8}$	$1\frac{1}{8}$	1·27	·31
$\frac{1}{6}$	$1\frac{1}{6}$	1·36	·34
$\frac{1}{4}$	$1\frac{1}{4}$	1·56	·39
$\frac{1}{2}$	$1\frac{1}{2}$	2·25	·56
$\frac{3}{4}$	$1\frac{3}{4}$	3·06	·76
(Same 1	2	4	1
size) 2	3	9	2·25
3	4	16	4
4	5	25	6·25
5	6	36	9
6	7	49	12·25
7	8	64	16
8	9	81	20·25
9	10	100	25
10	11	121	30·25
11	12	144	36
12	13	169	42·25
13	14	196	49
14	15	225	56·25
15	16	256	64
16	17	289	72·25
17	18	324	81
18	19	361	90·25
19	20	400	100
20	21	441	110·25
21	22	484	121
22	23	529	132·25
23	24	576	144
24	25	625	156·25
25	26	676	169
26	27	729	182·25
27	28	784	196
28	29	841	210·25
29	30	900	225
30	31	961	240·25

* With a double lens it is usually sufficient to measure from the position of the diaphragm plate.

As examples: suppose a copy is wanted having twice the linear dimensions of the original. Take the number 2, add 1 to it, and square the sum, $3^2=9$. Again, if a copy is to be of eight times the linear dimensions of the original, take the number 8, add 1, and square the sum, $9^2=81$. Copies respectively twice and eight times the size (linear) of the original will thus require relative exposures of 9 and 81—*i.e.*, the latter will require nine times the exposure of the former.

It is convenient to have a practical standard for unity. An image of the same size as the original is a familiar case, and serves as such standard. By dividing the figures in the third column by four, we get at the figures in the last column, which represent the exposure required for varying degrees of enlargement or reduction, compared with the exposure for a copy of the same size.

The table is carried up to enlargements of thirty diameters; that is about the amount required for enlarging a small *carte-de-visite* to life size.

The exposures required in reductions do not vary at all to the same extent that they do in enlargements. It has, therefore, not been thought necessary to fill in the steps between images of $\frac{1}{10}$ and $\frac{1}{20}$, and between $\frac{1}{20}$ and $\frac{1}{30}$ of the size of the original. Beyond $\frac{1}{30}$ there is scarcely any perceptible difference in the exposure until disturbance comes in from another cause, a considerable distance of illuminated atmosphere (haze or fog) intervening.

The figures in the second column will also serve as a table for distances from the lens to the plate and to the original, all that is necessary being to multiply by the principal focus of the lens in use. In the case of enlargements the figures less than 2 must be multiplied to get the distance from the original to the lens, and the figures greater than 2 for the distance from lens to image. For reductions, the figures less than 2, multiplied by the principal focus of the lens, yield the distance from lens to plate; and the figures higher than 2, similarly multiplied, give the distance of original from lens.

'UNIFORM SYSTEM' NUMBERS FOR STOPS FROM $\frac{f}{1}$ TO $\frac{f}{100}$.

In the following table Mr. S. A. Warburton has calculated the exposure necessary with every stop from $\frac{f}{1}$ to $\frac{f}{100}$ compared with the unit stop of the 'uniform system' of the Royal Photographic Society of Great Britain. The figures which are underlined show in the first column what $\frac{f}{a}$ must be in order to increase the exposure in geometrical ratio from $\frac{f}{4}$, the intermediate numbers showing the uniform system number for any other aperture.

f	U. S. No.	f	U. S. No.	f	U. S. No.
1	$\frac{1}{16}$	15	14·06	58	210·25
$1\frac{1}{4}$	·097	16	16	59	217·56
1·414	$\frac{1}{8}$	17	18·06	60	225·00
$1\frac{1}{2}$	·140	18	20·25	61	232·56
$1\frac{3}{4}$	·191	19	22·56		240·25
2	$\frac{1}{4}$	20	25·00	63	248·06
$2\frac{1}{4}$	·316	21	27·56	64	256
$2\frac{1}{2}$	·390	22	30·25	65	264·06
2·828	$\frac{1}{2}$	22·62	32	66	272·25
$2\frac{3}{4}$	·472	23	33·06	67	280·56
3	·562	24	36·00	68	289·00
$3\frac{1}{4}$	·660	25	39·06	69	297·56
$3\frac{1}{2}$	·765	26	42·25	70	306·25
$3\frac{3}{4}$	·878	27	45·56	71	315·06
4	1·00	28	49·00	72	324·00
$4\frac{1}{4}$	1·12	29	52·56	73	333·06
$4\frac{1}{2}$	1·26	30	56·25	74	342·25
$4\frac{3}{4}$	1·41	31	60·06	75	351·56
5	1·56	32	64	76	361·00
$5\frac{1}{4}$	1·72	33	68·06	77	370·56
$5\frac{1}{2}$	1·89	34	72·25	78	380·25
5·656	2	35	76·56	79	390·06
$5\frac{3}{4}$	2·06	36	81·00	80	400·00
6	2·25	37	85·56	81	410·06
$6\frac{1}{4}$	2·44	38	90·25	82	420·25
$6\frac{1}{2}$	2·64	39	95·06	83	430·56
$6\frac{3}{4}$	2·84	40	100·00	84	440·00
7	3·06	41	105·06	85	451·56
$7\frac{1}{4}$	3·28	42	110·25	86	462·25
$7\frac{1}{2}$	3·51	43	115·56	87	473·06
$7\frac{3}{4}$	3·75	44	121·00	88	484·00
8	4	45	126·56	89	495·06
$8\frac{1}{4}$	4·25	45·25	128	90	506·25
$8\frac{1}{2}$	4·51	46	132·25	90·50	512
$8\frac{3}{4}$	4·78	47	138·06	91	517·56
9	5·06	48	144·00	92	529·00
$9\frac{1}{4}$	5·34	49	150·06	93	540·56
$9\frac{1}{2}$	5·64	50	156·25	94	552·25
$9\frac{3}{4}$	5·94	51	162·56	95	564·06
10	6·25	52	169·00	96	576·00
11	7·56	53	175·56	97	588·06
11·31	8	54	182·25	98	600·25
12	9·00	55	189·06	99	612·56
13	10·56	56	196·00	100	625·00
14	12·25	57	203·06		

THE ROYAL PHOTOGRAPHIC SOCIETY'S STANDARD DIAPHRAGMS.

The annexed diagram and table are intended to facilitate the calculation of the proper number with which to mark the diaphragms according to the Royal Photographic Society of Great Britain's Uniform System, which will be found described on another page. This number is called the 'U. S.' (or uniform system number). The numbered circles in the diagram represent the sizes of stops. The photographer, knowing the equivalent focus of his lens, looks along the line opposite the number which represents the circle nearest inside to his diaphragm, and when he gets to th column headed by that equivalent focus the number there found is the U. S. number to be marked on the diaphragm. For example: a lens of eight inches equivalent focus has a diaphragm in size about No. 5 on the diaphragm; running the eye along the line opposite No. 5, we find in the column under—'focus eight inches' the number 11, which is the U. S. number required.

No. of Circle.	4 focus	5 focus	6 focus	7 focus	8 focus	9 focus	10 focus	12 focus	14 focus
1	25	39	56						
2	11	17	25	34	44	56	68		
3	$6\frac{1}{4}$	10	14	19	25	31	40	56	
4	4	$6\frac{1}{4}$	9	12	16	20	25	36	48
5	$2\frac{3}{4}$	$4\frac{1}{4}$	$6\frac{1}{4}$	$8\frac{1}{2}$	11	14	17	25	34
6	2	$3\frac{1}{5}$	$4\frac{1}{2}$	$6\frac{1}{4}$	8	10	13	18	25
7	$1\frac{1}{2}$	$2\frac{1}{2}$	$3\frac{1}{2}$	$4\frac{3}{4}$	6	8	10	14	19
8	$1\frac{1}{4}$	2	$2\frac{3}{4}$	$3\frac{3}{4}$	5	$6\frac{1}{4}$	8	11	15
9	1	$1\frac{1}{2}$	$2\frac{1}{4}$	3	4	5	$6\frac{1}{4}$	9	$12\frac{1}{4}$
10		1	$1\frac{1}{2}$	$2\frac{1}{8}$	$2\frac{3}{4}$	$3\frac{1}{2}$	$4\frac{1}{3}$	6	$8\frac{1}{2}$
11			$1\frac{1}{4}$	$1\frac{1}{2}$	2	$2\frac{1}{2}$	$3\frac{1}{5}$	5	6
12			$\frac{7}{8}$	$1\frac{1}{5}$	$1\frac{1}{2}$	2	$2\frac{1}{2}$	$3\frac{1}{2}$	$4\frac{3}{4}$
13				1	$1\frac{1}{4}$	$1\frac{5}{6}$	$1\frac{2}{3}$	$2\frac{3}{4}$	4
14					1	$1\frac{1}{4}$	$1\frac{1}{2}$	$2\frac{1}{4}$	3
15						1	$1\frac{1}{3}$	$1\frac{7}{8}$	$2\frac{1}{2}$
16							1	$1\frac{1}{2}$	2
17								$1\frac{1}{3}$	$7\frac{3}{8}$
18								$1\frac{1}{6}$	$1\frac{1}{2}$
19								1	$1\frac{1}{3}$
20									$1\frac{1}{6}$
21									1

TABLE FOR FINDING THE MINIMUM LENGTH OF STUDIO FOR A GIVEN LENS.

(From the 'American Amateur Photographer.')

DISTANCES IN INCHES FROM OBJECT TO LENS.

Equivalent Focus of Lens. In.	3 in. high.	4 in. high.	5 in. high.	6 in. high.	8 in. high.	10 in. high.	12 in. high.	16 in. high.	20 in. high.	24 in. high.	30 in. high.	36 in. high.	48 in. high.	54 in. high.	60 in. high.	72 in. high.
3	75	57														
4	100	76	$61\frac{3}{5}$	52												
5	125	95	77	65	50											
6	150	114	$92\frac{3}{5}$	78	60	$49\frac{1}{8}$										
8	200	152	$123\frac{1}{5}$	104	80	$65\frac{6}{10}$	56									
10	250	190	154	130	100	82	70	55								
12	300	228	$184\frac{4}{5}$	156	120	$98\frac{3}{5}$	84	66	$55\frac{1}{5}$							
16	400	304	$246\frac{2}{5}$	208	161	$131\frac{1}{5}$	112	88	$72\frac{2}{5}$	64	$54\frac{2}{5}$	48				
20	500	380	308	260	200	164	140	110	$90\frac{3}{4}$	80	68	60	50	$46\frac{2}{3}$		
24	600	456	$369\frac{3}{5}$	312	240	$196\frac{4}{5}$	168	132	$110\frac{2}{5}$	96	$81\frac{3}{5}$	72	60	56	$52\frac{4}{5}$	48
30	750	540	462	390	300	246	210	165	$136\frac{1}{8}$	120	102	90	75	70	65	60
36	900	684	$554\frac{2}{5}$	463	360	$307\frac{1}{5}$	252	198	$165\frac{3}{5}$	144	$122\frac{2}{5}$	108	90	84	$79\frac{1}{5}$	72
48	1200	912	$739\frac{1}{5}$	624	480	$393\frac{1}{5}$	336	264	$220\frac{4}{5}$	192	$163\frac{1}{5}$	144	120	112	$105\frac{3}{5}$	96
60	1500	1080	1024	780	600	492	420	330	$272\frac{1}{4}$	240	204	180	150	140	132	120
72	1800	1368	$1108\frac{4}{5}$	936	720	$614\frac{2}{5}$	504	396	$321\frac{1}{5}$	288	$244\frac{4}{5}$	216	180	168	$158\frac{3}{5}$	144

DISTANCES IN INCHES FROM LENS TO GROUND GLASS.

Equivalent Focus of Lens. In.	3 in. high.	4 in. high.	5 in. high.	6 in. high.	8 in. high.	10 in. high.	12 in. high.	16 in. high.	20 in. high.	24 in. high.	30 in. high.	36 in. high.	48 in. high.	54 in. high.	60 in. high.	72 in. high.
3	$3\frac{1}{8}$	$3\frac{1}{6}$														
4	$4\frac{1}{6}$	$4\frac{3}{9}$	$4\frac{5}{18}$	$4\frac{1}{3}$												
5	$5\frac{5}{24}$	$5\frac{5}{18}$	$5\frac{25}{72}$	$5\frac{5}{12}$	$5\frac{5}{9}$											
6	$6\frac{1}{6}$	$6\frac{1}{3}$	$6\frac{5}{12}$	$6\frac{1}{2}$	$6\frac{2}{3}$	$7\frac{1}{9}$										
8	$8\frac{1}{3}$	$8\frac{4}{9}$	$8\frac{5}{9}$	$8\frac{2}{3}$	$8\frac{8}{9}$	$9\frac{1}{9}$	$9\frac{1}{3}$									
10	$10\frac{5}{12}$	$10\frac{5}{9}$	$10\frac{25}{36}$	$10\frac{5}{6}$	$11\frac{1}{9}$	$11\frac{7}{18}$	$11\frac{1}{2}$	$12\frac{2}{9}$								
12	$12\frac{1}{2}$	$12\frac{2}{3}$	$12\frac{5}{6}$	13	$13\frac{1}{3}$	$13\frac{2}{6}$	14	$14\frac{2}{3}$	$15\frac{1}{3}$							
16	$16\frac{2}{3}$	$16\frac{8}{9}$	$17\frac{1}{9}$	$17\frac{1}{3}$	$17\frac{7}{9}$	$18\frac{2}{9}$	$18\frac{2}{3}$	$19\frac{5}{9}$	$20\frac{1}{6}$	$21\frac{1}{3}$	$22\frac{2}{3}$	24				
20	$20\frac{5}{6}$	$21\frac{1}{9}$	$21\frac{7}{18}$	$21\frac{2}{3}$	$22\frac{2}{9}$	$22\frac{7}{9}$	$23\frac{1}{3}$	$24\frac{4}{9}$	$25\frac{5}{24}$	$26\frac{2}{3}$	$28\frac{1}{3}$	30	$33\frac{1}{3}$	35		
24	25	$25\frac{1}{3}$	$25\frac{2}{3}$	26	$26\frac{2}{3}$	$26\frac{5}{9}$	28	$29\frac{1}{3}$	$30\frac{2}{3}$	32	34	36	40	42	44	48
30	$31\frac{1}{4}$	$31\frac{2}{3}$	$32\frac{1}{12}$	$32\frac{1}{2}$	$33\frac{1}{3}$	$34\frac{1}{6}$	35	$36\frac{2}{3}$	$38\frac{1}{3}$	40	$42\frac{1}{2}$	45	50	$52\frac{1}{2}$	55	60
36	$37\frac{1}{2}$	38	$38\frac{1}{2}$	39	$39\frac{2}{3}$	40	42	44	46	48	51	54	60	63	66	72
48	50	$50\frac{2}{3}$	$51\frac{1}{3}$	52	$53\frac{1}{3}$	$54\frac{2}{3}$	56	$58\frac{2}{3}$	$61\frac{1}{3}$	64	68	72	80	84	88	96
60	$62\frac{1}{2}$	$63\frac{1}{3}$	$64\frac{1}{6}$	65	$66\frac{2}{3}$	$68\frac{1}{3}$	70	$73\frac{1}{3}$	$77\frac{2}{3}$	80	85	90	100	105	110	120
72	75	76	77	78	$79\frac{1}{3}$	80	84	88	92	96	102	108	120	126	132	144

Suppose the lens used is 24 in. equivalent focus, and you wish to make a full-length portrait of a man 6 ft. high, in which the image will be 6 in. high. Look at the left-hand column for lens focus, and in the top line for size of image. At the intersection of these columns we find 312 in. = 26 ft., to be the distance the person must stand from the lens. In the next table, using the same lens and size of image as before, at the intersection of the columns we find 26 in., which represents the distance of the ground glass from lens centre. And in the same way any lens and size of image may be computed for.

CONTINENTAL STOPS AND THEIR U.S. EQUIVALENTS.

MR. EDWARD M. NELSON says: 'Photographers are frequently troubled by the Continental nomenclature of the stops, and wish to know the U.S. equivalents for them. The method of finding this out is very simple. All that is necessary is to divide f-4 by the ratio to be converted, and square the result. Example: Required the U.S. equivalent of f-9:—

$$\frac{f}{4} \div \frac{f}{9} = \frac{f}{4} \times \frac{9}{f} = 2{\cdot}25;$$

the square of 2·25 is 5·06, the U.S. number required. The following is a table of the Continental stops more commonly met with, and also the Continental values of the U.S. ratios:—

Ratios. f divided by	Continental Values.	U.S. Values.	Ratios. f divided by	U.S. Values.	Continental Values.
4·5	512	1·26	2·828	·5	1250
6·3	256	2·48	4	1	625
7	204	3·06	5·66	2	312
7·2	193	3·24	8	4	156
7·7	168	3·71	11·31	8	78
9	128	5·06	16	16	39
12·5	64	9·77	22·6	32	20
14·5	47	13	32	64	9·77
18	32	20	45·3	128	4·88
25	16	39	64	256	2·44
36	8	81	90·5	512	1·22
50	4	156	...	...	...
71	2	315	...	...	...
100	1	625	...	...	...

'To find the f ratio for the U.S. values, multiply the U.S. value by 16, and the square root of the product is the required ratio. Example: What is the ratio of U.S. 32? 32 multiplied by 16 is 512, the square root of this is 22·6, the ratio required.

'To find the f ratio for the Continental stops, multiply the reciprocal of the square root of the Continental value by 100. Example: What is the f ratio of the Continental value 16? The square root of 16 is 4, the reciprocal of 4 is ·25, which, multiplied by 100, is 25, the ratio required.

'*Note.*—The Continental ratios of 512, 256, and 8, ought to be 4·4, 6·25, and 35, respectively. The figures in the list are those extracted from Continental opticians' catalogues.'

TABLE SHOWING DISPLACEMENT ON GROUND GLASS OF OBJECTS IN MOTION.

By Henry L. Tolman.

From the 'Photographic Times.'

Lens 6 Inches Equivalent Focus, Ground Glass at Principal Focus of Lens.

Miles per hour.	Feet per second.	Distance on Ground Glass, in Inches, with Object 30 Feet away.	Same with Object 60 Feet away.	Same with Object 120 Feet away.
1	1½	·29	·15	·073
2	3	·59	·29	·147
3	4½	·88	·44	·220
4	6	1·17	·59	·293
5	7½	1·47	·73	·367
6	9	1·76	·88	·440
7	10½	2·05	1 03	·513
8	12	2·35	1·17	·587
9	13	2·64	1·32	·660
10	14½	2·93	1·47	·733
11	16	3·23	1·61	·807
12	17½	3·52	1·76	·880
13	19	3·81	1·91	·953
14	20½	4·11	2·05	1·027
15	22	4·40	2·20	1·100
20	29	5·87	2·93	1·467
25	37	7·33	3·67	1·833
30	44	8·80	4·40	2·200
35	51	10·27	5·13	2·567
40	59	11·73	5·97	2·933
45	66	13·20	6·60	3·300
50	73	14·67	7·33	3 667
55	80	16·13	8·06	4·033
60	88	17·60	8·80	4 400
75	110	22·00	11·00	5·500
100	147	29·33	14 67	7·333
125	183	36·67	18 33	9·167
150	220	44·00	22·00	11·000

THE ROYAL PHOTOGRAPHIC SOCIETY'S STANDARDS.

[The following is reprinted from the Society's *Journal.*]

THE Standards adopted by the Society in 1881 have been carefully reconsidered to see what additions or modifications were desirable.

The following statement is complete so far as the subjects it deals with are concerned :—

LENS DIAPHRAGMS.

It is recommended :—

1st. That the aperture of the standard-unit diaphragm have a diameter equal to one-fourth the equivalent focal length of the lens.

2nd. That diaphragms with smaller openings have apertures diminishing in area to the extent of one-half from the unit standard downwards.

3rd. That every diaphragm be marked with its intensity ratio, and also with the relation that the diameter of its aperture bears to the equivalent focal length of the lens, thus:—

$$\frac{f}{4};\ 2\,\frac{f}{5{\cdot}6};\ 4\,\frac{f}{8};\ 8\,\frac{f}{11{\cdot}3};\ 16\,\frac{f}{16};\ 32\,\frac{f}{22{\cdot}6};\ 64\,\frac{f}{32};\ 128\,\frac{f}{45{\cdot}2};\ 256\,\frac{f}{64};\ \&c.$$

Should a lens not admit of a diaphragm with an aperture as large in diameter as one-fourth its focal length, nor exactly any one of the above-mentioned sizes, it is still recommended that all the apertures be made in uniformity with the above scale, with the exception of the largest, which should be marked with the number its area requires in relation to the unit diaphragm. In the case of a lens having a working aperture exceeding in diameter one-fourth its focal length, the diaphragms should be marked according to the sizes of their relative apertures: for example :—

$$0{\cdot}5\,\frac{f}{2{\cdot}8};\ 0{\cdot}25\,\frac{f}{2},\ \&c.$$

And diaphragms which require to be made with apertures intermediate to the standard sizes should be marked in a corresponding manner.

LENS MOUNTS AND FITTINGS.

It is recommended :—

1st. That the equivalent focal length of each lens be engraved upon its mount.

2nd. That the following series of screws for photographic lens flange fittings be adopted:—

Diameter in Inches.	No. of Threads per Inch.	Core Diameter in Inches.
1	24	·9466
1·25	24	1·1966
1·5	24	1·4466
1·75	24	1·6966
2	24	1·9466
2·25	24	2·1966
2·5	24	2·4466
3	24	2·9466
3·5	12	3·3933
4	12	3·8933
5	12	4·8933
And upwards, advancing by inches.	12	

The form of thread is that known as Whitworth's Angular Thread, and is designed as follows:—Two parallel lines, at a distance apart equal to 0·96 of the screw pitch, are intersected by lines inclined to each other at 55°. One-sixth of the vertical height of the triangular spaces so obtained is rounded off both at the top and bottom. The depth of this thread is 0·64 of the screw pitch.

3rd. That every flange and adapter have a mark upon its front to indicate the position of the diaphragm slot or index of any lens when screwed home. The mark on any adapter should coincide with the mark upon any flange into which it is screwed. This mark should be placed at the point at which the thread becomes complete at the shoulder of the flange or adapter.

Camera Screws.

It is recommended:—

That all screws fitted to cameras, either for attachment to the stand, for fixing rising fronts, or for other movable parts, be either $\frac{3}{16}$, $\frac{1}{4}$, $\frac{5}{16}$, or $\frac{3}{8}$ of an inch in external diameter, and in pitch of thread and other details in accordance with the generally recognised Whitworth standards for these sizes.

Focus of Lens, inches.	TIMES OF ENLARGEMENT AND REDUCTION.							
	1 inches.	2 inches.	3 inches.	4 inches.	5 inches.	6 inches.	7 inches.	8 inches.
2	4 4	6 3	8 $2\frac{2}{3}$	10 $2\frac{1}{2}$	12 $2\frac{2}{5}$	14 $2\frac{1}{3}$	16 $2\frac{2}{7}$	18 $2\frac{1}{4}$
$2\frac{1}{2}$	5 5	$7\frac{1}{2}$ $3\frac{3}{4}$	10 $3\frac{1}{3}$	$12\frac{1}{2}$ $3\frac{1}{8}$	15 3	$17\frac{1}{2}$ $2\frac{11}{12}$	20 $2\frac{6}{7}$	$22\frac{1}{2}$ $2\frac{13}{16}$
3	6 6	9 $4\frac{1}{2}$	12 4	15 $3\frac{3}{4}$	18 $3\frac{3}{5}$	21 $3\frac{1}{2}$	24 $3\frac{3}{7}$	27 $3\frac{3}{8}$
$3\frac{1}{2}$	7 7	$10\frac{1}{2}$ $5\frac{1}{4}$	14 $4\frac{2}{3}$	$17\frac{1}{2}$ $4\frac{3}{8}$	21 $4\frac{1}{5}$	$24\frac{1}{2}$ $4\frac{1}{12}$	28 4	$31\frac{1}{2}$ $3\frac{15}{16}$
4	8 8	12 6	16 $5\frac{1}{3}$	20 5	24 $4\frac{4}{5}$	28 $4\frac{2}{3}$	32 $4\frac{4}{7}$	36 $4\frac{1}{2}$
$4\frac{1}{2}$	9 9	$13\frac{1}{2}$ $6\frac{3}{4}$	18 6	$22\frac{1}{2}$ $5\frac{5}{8}$	27 $5\frac{2}{5}$	$31\frac{1}{2}$ $5\frac{1}{4}$	36 $5\frac{1}{7}$	$40\frac{1}{2}$ $5\frac{1}{16}$
5	10 10	15 $7\frac{1}{2}$	20 $6\frac{2}{3}$	25 $6\frac{1}{4}$	30 6	35 $5\frac{5}{6}$	40 $5\frac{5}{7}$	45 $5\frac{5}{8}$
$5\frac{1}{2}$	11 11	$16\frac{1}{2}$ $8\frac{1}{4}$	22 $7\frac{1}{3}$	$27\frac{1}{2}$ $6\frac{7}{8}$	33 $6\frac{3}{5}$	$38\frac{1}{2}$ $6\frac{5}{12}$	44 $6\frac{2}{7}$	$49\frac{1}{2}$ $6\frac{3}{16}$
6	12 12	18 9	24 8	30 $7\frac{1}{2}$	36 $7\frac{1}{5}$	42 7	48 $6\frac{6}{7}$	54 $6\frac{3}{4}$
7	14 14	21 $10\frac{1}{2}$	28 $9\frac{1}{3}$	35 $8\frac{3}{4}$	42 $8\frac{2}{5}$	49 $8\frac{1}{6}$	56 8	63 $7\frac{7}{8}$
8	16 16	24 12	32 $10\frac{2}{3}$	40 10	48 $9\frac{3}{5}$	56 $9\frac{1}{3}$	64 $9\frac{1}{7}$	72 9
9	18 18	27 $13\frac{1}{2}$	36 12	45 $11\frac{1}{4}$	54 $10\frac{4}{5}$	63 $10\frac{1}{2}$	72 $10\frac{2}{7}$	81 $10\frac{1}{8}$

THE object of this table is to enable any manipulator who is about to enlarge (or reduce) a copy any given number of times, to do so without troublesome calculation. It is assumed that the photographer knows exactly what the focus of his lens is, and that he is able to measure accurately from its optical centre. The use of the table will be seen from the following illustration:—A photographer has a *carte* to enlarge to four times its size, and the lens he intends employing is one of six inches equivalent focus. He must, therefore, look for 4 on the upper horizontal line, and for 6 in the first vertical column, and carry his eye to where these two join, which will be at 30—$7\frac{1}{2}$. The greater of these is the distance the sensitive plate must be from the centre of the lens; and the lesser, the distance of the picture to be copied. To *reduce* a picture any given number of times the same method must be followed, but in this case the greater number will represent the distance between the lens and the picture to be copied; the latter, that between the lens and the sensitive plate. This explanation will be sufficient for every case of enlargement or reduction.

If the focus of the lens be twelve inches, as this number is not in the column of focal lengths, look out for six in this column and multiply by 2, and so on with any other numbers.

TABLE OF VIEW-ANGLES.

By Clarence E. Woodman, Ph.D.

Divide the Base of the Plate by the Equivalent Focus of the Lens;

If the quotient is	The angle is	If the quotient is	The angle is	If the quotient is	The angle is
	Degrees.		Degrees.		Degrees.
·282	16	·748	41	1·3	66
·3	17	·768	42	1·32	67
·317	18	·788	43	1·36	68
·335	19	·808	44	1·375	69
·353	20	·828	45	1·4	70
·37	21	·849	46	1·427	71
·389	22	·87	47	1·45	72
·407	23	·89	48	1·48	73
·425	24	·911	49	1·5	74
·443	25	·933	50	1·53	75
·462	26	·954	51	1·56	76
·48	27	·975	52	1·59	77
·5	28	1·	53	1·62	78
·517	29	1·02	54	1·649	79
·536	30	1·041	55	1·678	80
·555	31	1·063	56	1·7	81
·573	32	1·086	57	1·739	82
·592	33	1·108	58	1·769	83
·611	34	1·132	59	1·8	84
·631	35	1·155	60	1·833	85
·65	36	1·178	61	1·865	86
·67	37	1·2	62	1·898	87
·689	38	1·225	63	1·931	88
·708	39	1·25	64	1·965	89
·728	40	1·274	65	2·	90

Example.—Given a lens of 13 inches equivalent focus; required the angle included by it on plates respectively $3\frac{1}{4} \times 4\frac{1}{4}$, $4\frac{1}{4} \times 6\frac{1}{2}$, $6\frac{1}{2} \times 8\frac{1}{2}$, 8×10, 10×12, and 11×14.

1. Dividing 4·25 by 13, we have as quotient ·327—midway between the decimals ·317 and ·335 of our table; therefore the required angle is 18° 30′. Similarly—

						Degrees.
2.	6·5	÷	13	=	·5;	corresponding to 28.
3.	8·5	÷	13	=	·654;	,, ,, 36.
4.	10	÷	13	=	·77;	,, ,, $42\frac{1}{2}$.
5.	12	÷	13	=	·923	,, ,, $49\frac{1}{2}$.
6.	14	÷	13	=	1·08	,, ,, 57.

THE following simple optical formulæ and calculations, worked out by Mr. J. A. C. Branfill, will prove useful in many branches of photography, especially where several lenses of varying foci are in constant use for a variety of purposes :—

Let p = Principal focus.
F = Greater conjugate do.
f = Lesser do. do.
$D = F + f$ = distance of image from object.
r = Ratio of any dimension in original to the same dimension in copy (in case of reduction), or *vice versâ* (in case of enlargement).
a = Effective diameter of diaphragm.
U. S. No. = 'Uniform System' No. of do.
x = Comparative exposure required.

Then
$$p = D \times \frac{r}{(r+1)^2} = \frac{Ff}{D} = \frac{F}{r+1} = \frac{rf}{r+1}$$
$$F = p\,(r+1) = \frac{pf}{f-p} = rf = \frac{rD}{r+1}$$
$$f = p \times \frac{(r+1)}{r} = \frac{pF}{F-p} = \frac{D}{r+1} = \frac{F}{r}$$
$$D = p \times \frac{(r+1)^2}{r} = f\,(r+1) = p\left(2 + r + \frac{1}{r}\right)$$
$$r = \frac{F-p}{p} = \frac{p}{f-p} = \frac{F}{f}$$
$$\text{U. S. No.} = \frac{p^2}{16\,a^2}$$
$$x = \frac{f^2}{16\,a^2} = \frac{p^2}{16\,a^2} \times \frac{(r+1)^2}{r^2}$$

N.B.—For ordinary landscape work, where r is greater than 20, x may be taken as $\frac{p^2}{16\,a^2}$

NOTE.—In case the above may not be clear to some photographers, the following rules may be better understood :—

To find the principal focus of a lens (p), focus a near object in the camera, and measure the distance between it and the ground-glass (D); next find the proportion which any dimension in the object bears to the same dimension on the ground-glass (r). Thus, if the original dimension be four times as large as its reproduction, we say that r equals (=) 4. Multiply D by r, and divide the product by the square of a number greater by one than r, or $(r+1)^2$. This rule was lately published by Mr. Debenham.

To find the lesser conjugate focus (f) (if p and r are known) multiply p by the sum of $r + 1$ and divide the product by r. Or divide D by $r + 1$.

To find the greater conjugate focus (F) multiply p by $r + 1$. Or multiply f by r.

To find D (the distance which the ground-glass should be from the object to be copied in order to get a given value for r) multiply p by the sum of $r + \frac{1}{r} + 2$.

To find r divide $F - p$ (the difference between F and p) by p. Or divide p by $f - p$. Or divide F by f.

To find x divide the square of f by 16 times the square of a (the diameter of aperture to lens).

For example: focus an object which is five inches high, so that it is one inch high on the ground glass; thus we know that $r = 5$. Next measure the distance between the object and the ground glass (D), which is found to be 45 inches.

Then $p = 45 \times$ (multiplied by) $5 \div$ (divided by) $6 \times 6 = 6\frac{1}{4}$ inches.
$f = 6\frac{1}{4} \times 6 \div 5 = 7\frac{1}{2}$ inches. Or $f = 45 \div 6 = 7\frac{1}{2}$ inches.
$F = 6\frac{1}{4} \times 6 = 37\frac{1}{2}$ inches. Or $F = 7\frac{1}{2} \times 5 = 37\frac{1}{2}$ inches.
$D = 6\frac{1}{4} \times (5 + \frac{1}{5} + 2) = 6\frac{1}{4} \times 7\frac{1}{5} = 45$ inches.
$r = (37\frac{1}{2} - 6\frac{1}{4}) \div 6\frac{1}{4} = 5$. Or $r = 6\frac{1}{4} \div (7\frac{1}{2} - 6\frac{1}{4}) = 5$.

MR. E. M. NELSON'S TABLE OF DISTANCES FOR LANTERN PROJECTION.

DISTANCE OF PROJECTION LENS FROM SCREEN, MASK BEING THREE INCHES.

Foci	4½	5	5½	6	7	8	9	10	11	12	14	15	16	18
Disc.	ft. in.	ft. in.	ft. in.	ft. in.	ft. in.	ft. in.	ft. in.	ft. in.	ft. in.	ft.	ft. in.	ft. in.	ft. in.	ft. in.
5	7 10½	8 9	9 7½	10 6	12 3	14 0	15 9	17 6	19 3	21	24 6	26 3	28 0	31 6
6	9 4½	10 5	11 5½	12 6	14 7	16 8	18 9	20 10	22 11	25	29 2	31 3	33 4	37 6
7	10 10½	12 1	13 3½	14 6	16 11	19 4	21 9	24 2	26 7	29	33 10	36 3	38 8	43 6
8	12 4½	13 9	15 1½	16 6	19 3	22 0	24 9	27 6	30 3	33	38 6	41 3	44 0	49 6
9	13 10½	15 5	16 11½	18 6	21 7	24 8	27 9	30 10	33 11	37	43 2	46 3	49 4	55 6
10	15 4½	17 1	18 9½	20 6	23 11	27 4	30 9	34 2	37 7	41	47 10	51 3	54 8	61 6
11	16 10½	18 9	20 7½	22 6	26 3	30 0	33 9	37 6	41 3	45	52 6	56 3	60 0	67 6
12	18 4½	20 5	22 5½	24 6	28 7	32 8	36 9	40 10	44 11	49	57 2	61 3	65 4	73 6
13	19 10½	22 1	24 3½	26 6	30 11	35 4	39 9	44 2	48 7	53	61 10	66 3	70 8	79 6
14	21 4½	23 9	26 1½	28 6	33 3	38 0	42 9	47 6	52 3	57	66 6	71 3	76 0	85 6
15	22 10½	25 5	27 11½	30 6	35 7	40 8	45 9	50 10	55 11	61	71 2	76 3	81 4	91 6
16	24 4½	27 1	29 9½	32 6	37 11	43 4	48 9	54 2	59 7	65	75 10	81 3	86 8	97 6
18	27 4½	30 5	33 5½	36 6	42 7	48 8	54 9	60 10	66 11	73	85 2	91 3	97 4	109 6
20	30 4½	33 9	37 1½	40 6	47 3	54 0	60 9	67 6	74 3	81	94 6	101 3	108 0	121 6
25	37 10½	42 1	46 3½	50 6	58 11	67 4	75 9	84 2	92 7	101	117 10	126 3	134 8	151 6
30	45 4½	50 5	55 5½	60 6	70 7	80 8	90 9	100 10	110 11	121	141 2	151 3	161 4	181 6
35	52 10½	58 9	64 7½	70 6	82 3	94 0	105 0	117 6	129 3	141	164 6	176 3	188 0	211 6
40	60 4½	67 1	73 9½	80 6	93 11	107 4	120 9	134 2	147 7	161	187 10	201 3	214 8	241 6
45	67 10½	75 5	82 11½	90 6	105 7	120 8	135 9	150 10	165 11	181	211 2	226 3	241 4	271 6
50	75 4½	83 9	92 1½	100 6	117 3	134 0	150 9	167 6	184 3	201	234 6	251 3	268 0	301 6

TABLE OF DISTANCES FOR AN OBJECT OF SIXTY-EIGHT INCHES HEIGHT.

COMPUTED BY P. BROSIG.

Equivalent Focus (inches).	Heights of Images (inches).																	
	1	2	3	4	6	8	10	12	14	16	20	24	28	32	40	48	56	68
2	138·0 2·0	70·0 2·1	47.3 2·1	36·0 2·1														
3	207·0 3·0	105·0 3·1	71·0 3·1	54·0 3·2	37·0 3·3													
4	276·0 4·1	140·0 4·1	94·7 4·2	72·0 4·2	49·3 4·4	38·0 4·5												
5	345·0 5·1	175·0 5·1	118·3 5·2	90·0 5·3	61·7 5·4	47·5 5·6	39·0 5·7											
6	414·0 6·1	210·0 6·2	142·0 6·3	108·0 6·4	74·0 6·5	57·0 6·7	46·8 6 9	40·0 7·1	35·1 7·2									
7	483·0 7·1	245·0 7·2	165·7 7·3	126·0 7·4	86·3 7 6	66·5 7 8	54·6 8·0	46 7 8 2	41·0 8·4	36·7 8·6								
8	552·0 8·1	280·0 8·2	189·3 8·4	144·0 8·5	98·7 8·7	76·0 8·9	62·4 9·2	53·3 9·4	46·9 9·6	42 0 9·9	35 2 10·4							
9	621 0 9·1	315·0 9·3	213·0 9·4	162·0 9·5	111·0 9·8	85·5 10·1	70 2 10·3	60·0 10·6	52·7 10·9	47·2 11·1	39 6 11·6							
10	690·0 10·1	350·0 10·3	236·7 10·4	180·0 10·6	123·3 10 9	95·0 11·2	78·0 11·5	66·7 11·8	58·6 12·1	52·5 12·4	44·0 12·9	38·3 13·5	34·3 14·1					
11	759·0 11·2	385·0 11·3	260·3 11·5	198·0 11·6	135·7 12·0	104·5 12·3	85 8 12·6	73·3 12·9	64·4 13·3	57·7 13·6	48·4 14·2	42·2 14·9	37·7 15·5	34·4 16·2				
12	828·0 12·2	420·0 12·4	284·0 12·5	216·0 12·7	148·0 13·1	114·0 13·4	93·6 13·8	80·0 14·1	70·3 14·5	63·0 14·8	52·8 15·5	46·0 16·2	41·1 16·9	37·5 17 6				
13	897·0 13·2	455·0 13·4	307·7 13·6	234·0 13·8	160·3 14·1	123·5 14·5	101·4 14·9	86·7 15·3	76·1 15·7	68·2 16·1	57·2 16·8	49·8 17·6	44 6 18·4	40·6 19·1	35·1 20·6			

Values are omitted in this space on account of the wide angle of lens required. (More than ninety degrees.)

14	966·0 14·2	490·0 14·4	331·3 14·6	252·0 14·8	172·7 15·2	133·0 15·6	109·2 16·1	93·3 16·5	82·0 16·9	73·5 17·3	61·6 18·0	53·7 18·9	48·0 19·8	43·7 20·6	37·8 22·2			
16	1104 16·2	560·0 16·5	378·7 16·7	288·0 16·9	197·3 17·4	152·0 17·9	124·8 18·4	106·7 18·8	93·7 19·3	84·0 19·8	70·4 20·7	61·3 21·6	54·9 22·6	50·0 23·5	43·2 25·4	38·7 27·3	35·4 29·2	
18	1242 18·3	630·0 18·5	426·0 18·8	324·0 19·1	222·0 19·6	171·0 20·1	140·4 20·6	120·0 21·2	105·4 21·7	94·5 22·2	79·2 23·3	69·0 24·4	61·7 25·4	56·2 26·5	48·6 28·6	43·5 30·7	39·9 32·8	36·0 36·0
20	1380 20·3	700·0 20·6	473·3 20·9	360·0 21·2	246·7 21·8	190·0 22·4	156·0 22·9	133·3 23·5	117·1 24·1	105·0 24·7	88·0 25·9	76·7 27·1	63·6 28·2	62·5 29·4	54·0 31·8	48·3 34·1	44·3 36·5	40·0 40·0
22	1518 22·3	770·0 22·6	520·7 23·0	396·0 23·3	271·3 23·9	209·0 24·6	171·6 25·2	146·7 25·9	128·9 26·5	115·5 27·2	96·8 28·5	84·3 29·8	75·4 31·1	68·7 32·4	59·4 34·9	53·2 37·5	48·7 40·1	44·0 44·0
24	1656 24·4	840·0 24·7	568·0 25·1	432·0 25·4	296·0 26·1	228·0 26·8	187·2 27·5	160·0 28·2	140·6 28·9	126·0 29·6	105·6 31·1	92·0 32·5	82·3 33·9	75·0 35·3	64·8 38·1	58·0 40·9	53·1 43·8	48·0 48·0
26	1794 26·4	910·0 26·8	615·3 27·1	468·0 27·5	320·6 28·3	247·0 29·0	202·8 29·8	173·3 30·6	152·3 31·3	136·5 32·1	114·4 33·6	99·7 35·2	89·1 36·7	81·2 38·2	70·2 41·3	62·8 44·4	57·6 47·4	52·0 52·0
28	1932 28·4	980·0 28·8	662·7 29·2	504·0 29·6	315·3 30·5	266·0 31·3	218·4 32·1	186·7 32·9	164·0 33·8	147·0 34·6	123·2 36·2	107·3 37·9	96·0 39·5	87·5 41·2	75·6 44·5	67·7 47·8	62·0 51·1	56·0 56·0
32	2208 32·5	1120 32·9	757·3 33·4	576·0 33·9	394·7 34·8	304·0 35·8	249·6 36·7	213·3 37·6	187·4 38·6	168·0 39·5	140·8 41·4	122·7 43·3	109·7 45·2	100·0 47·1	86·4 50·8	77·3 54·6	70·9 58·4	64·0 64·0
36	2484 36·5	1260 37·1	852·0 37·6	648·0 38·1	444·0 39·2	342·0 40·2	280·8 41·3	240·0 42·4	210·9 43·4	189·0 44·5	158·4 46·6	138·0 48·7	123·4 50·8	112·5 52·9	97·2 57·2	87·0 61·4	79·7 65·6	72·0 72·0
44	3036 44·6	1540 45·3	1041 45·9	792·0 46·6	542·7 47·9	418·0 49·2	343·2 50·5	293·3 51·8	257·7 53·1	231·0 54·3	193·6 56·9	168·7 59·6	150·9 62·1	137·5 64·7	118·8 69·9	106·3 75·1	97·4 80·2	88·0 88·0
52	3588 52·8	1820 53·5	1231 54·3	936·0 55·1	641·3 56·6	494·0 58·1	405·6 59·6	346·7 61·2	304·6 62·7	273·0 64·2	228·8 67·3	199·3 70·4	178·3 73·4	162·5 76·5	140·4 82·6	125·7 88·7	115·1 94·8	104·0 104·0

This table gives, in inches, the distances from lens to object (greater conjugate focus, upper number) and from lens to ground glass (lesser conjugate focus, lower number) for different heights of images and different lengths of foci of lenses, when the height of object is 68 inches (=average height of man).

EXAMPLES.

Q.—What is the height of image of a person who is 133 inches distant from lens, when a lens of 14 inches focus is used?

A.—The height of image in this case is 8 inches.

Q.—What are the distances between object, lens, and ground glass if the image of a person is to be 8 inches high and a 14 inches focus lens is employed?

A.—The distance from object to lens will be 133 inches, from lens to ground glass 15·6 inches.

TABLES OF DISTANCES AT AND BEYOND WHICH ALL OBJECTS ARE IN FOCUS.

SIR D. SALOMON'S TABLE.

Focus of Lens in inches.	Ratios marked on Stops.													
	f/7	f/8	f/9	f/10	f/11	f/12	f/13	f/14	f/15	f/16	f/17	f/18	f/19	f/20
	Number of feet after which all is in focus.													
4	19	17	15	14	13	12	11	10	9	9	8	8	7	7
4¼	21	19	17	15	14	12	11	11	10	10	9	9	8	7
4½	25	22	19	17	16	15	13	13	12	11	10	10	9	9
4¾	27	23	21	19	18	16	15	14	13	12	12	11	10	10
5	30	27	24	21	19	18	17	15	14	14	13	12	11	10
5¼	33	29	25	23	21	20	18	17	16	15	14	13	13	12
5½	37	31	29	26	23	22	20	19	17	16	15	15	14	13
5¾	39	34	31	28	26	24	22	20	18	18	17	16	15	14
6	43	38	33	31	28	26	24	22	21	20	18	17	16	15
6¼	47	41	37	33	30	23	26	24	22	20	20	19	18	17
6½	50	45	40	36	33	29	28	26	24	23	21	20	19	18
6¾	55	48	43	39	36	32	30	28	25	24	22	22	21	20
7	58	52	45	42	38	35	31	30	28	26	25	23	22	21

DR. J. J. HIGGINS'S TABLE.

Equivalent Focus.	f/5	f/6	f/7	f/8	f/9	f/10	f/11	f/12	f/13	f/14	f/15
5 inches	42	35	30	26	23	21	19	17½	16	15	14
5½ ,,	50½	42	36	32	28	25	23	21	19	18	17
6 ,,	60	50	43	38	34	30	27	25	23	21	20
6½ ,,	70½	59	50	44	39	35	32	29½	27	25	23½
7 ,,	82	68	59	51	45	41	39	34	31	29½	27

Calculated for a Confusion Disc of less than $\frac{1}{100}$ of an inch.

RULES OF THE PHOTOGRAPHIC CLUB.

[WE frequently receive requests, from those engaged in the formation of new Photographic Societies, for information concerning the Rules that are necessary. The Rules of the Photographic Club, here appended, will be found an admirable basis to work on.]

I.—The Photographic Club is formed for the purpose of enabling its Members to discuss technical details connected with photography in a social manner.

II.—The Officers of the Club, hereinafter called the Committee, shall consist of two Trustees, Treasurer, Secretary, Recorder, Curator, Librarian, and eight other Members of Committee, five of whom shall form a quorum. The offices of Treasurer and Secretary may be merged into one at the discretion of the Committee.

III.—The Committee shall make such Bye-laws and Regulations (not inconsistent with the Rules) as they may from time to time think necessary.

IV.—The Committee shall have the power to appoint Sub-Committees, for special objects, from the Members of the Club.

V.—A Chairman shall be nominated each evening to preside at the next Meeting of the Club, and, should such proposed Chairman be absent, the Members present shall elect a Chairman on that night.

VI.—The Club shall be opened at 7: one hour, 8 to 9, each evening shall be devoted to the discussion of technical business; the remainder of the evening to social purposes. The Chairman to have the control of the Meeting only during the time devoted to technical business.

VII.—The accounts of the Club shall be audited annually by two Auditors, to be elected from the Members of the Club at the Meeting, twenty-eight days prior to the Annual General Meeting. No Officer or Member of Committee to be eligible to act as Auditor.

VIII.—The Officers of the Club shall retire annually, but shall be eligible for re-election, if nominated; but no ordinary Member of the Committee shall be eligible for re-election, after serving three consecutive years, until after a lapse of one year. Names of gentlemen proposed as Officers shall be posted on the notice-board fourteen days previous to the Annual General Meeting. Should any Officer resign, or become incapable of acting, the Committee may, at their next Meeting, proceed to fill up the vacancy thereby occasioned.

IX.—There shall be an Annual General Meeting of the Club, held the first Wednesday in November in every year, for the purpose of receiving the Balance-sheet for the past year and the Report of the Committee, the election of Officers (such election to be by ballot, and not by show of hands), and also for any other business in connexion with the Club that may require the decision of a General Meeting. Notice of the Meeting to be sent by post to each Member fourteen days before the date of such Annual General Meeting.

X.—No subject that does not relate to the management of the Club shall be brought forward at the Annual General Meeting; and no altera-

tion in the Rules shall be proposed of which fourteen days' notice shall not have been given.

XI.—A Special General Meeting of the Club shall be called by the Secretary upon the requisition of twelve Members, such requisition to be placed on the notice-board fourteen days before the date of the Special Meeting, the Special Meeting to be held on the usual Meeting night of the Club, after 9 o'clock; but no subject shall be discussed thereat except that stated on the requisition calling the Meeting.

XII.—All Candidates for Membership shall be proposed and seconded by two Members of the Club, the name of each Candidate, his proposer and seconder, to be posted on the board fourteen days before being balloted for; one black ball in five to exclude. The election of a new Member shall be notified to him in writing, with a request for the payment of his subscription. No Member shall be entitled to enjoy the advantages of, or in any way use, the Club until his subscriptions for the current year be paid. Members shall have the power of electing Honorary Members nominated by the Committee, who shall enjoy the privileges of the Club, but not the power of voting on any subject whatever, or holding any office.

XIII.—The Annual Subscriptions for Town Members shall be One Guinea, payable in advance, to the Treasurer, on the first Wednesday in November in each year. Members residing not less than fifteen miles from London (the General Post Office) shall be considered Country Members, and shall pay a subscription of half-a-guinea per annum so long as they continue so to reside; but no Member having a photographic business within that radius shall be considered a Country Member. Members joining the Club before the 31st of January shall pay the full subscription. After the end of January and before the 31st of May, the payment shall be two-thirds; after the end of May and before the 30th of September, one-third; the subscription of any Member elected after the 30th of September shall be considered payment for the following year.

XIV.—The payment by a Member of 10*l.* 10*s.* in one sum shall constitute Life Membership; but the number of Life Members shall not exceed five. Candidates for Life Membership shall be accepted in priority of application.

XV.—All subscriptions are due on the first Wednesday in November of each year, and, if not paid within one month, the Secretary shall write to the Member requesting payment, and, if the subscription be not then paid within one month, the Committee shall have power to remove the name from the list of Members.

XVI.—Each Member shall communicate any change of address to the Secretary, and all notices sent to such address shall be considered as duly delivered.

XVII.—The Secretary shall be required to keep proper books of accounts, together with a minute-book. The books of the Club, except the minute-book of the Committee, shall be open to the inspection of the Members on every night of Meeting.

XVIII.—Members shall be at liberty to introduce Visitors to the Meetings of the Club, but the Committee shall have the power to limit the number of such Visitors. An attendance-book shall be kept in which Members and Visitors present at each Meeting shall sign their names.

XIX.—Any Member making himself obnoxious to the Members of the Club shall be reported to the Committee, who shall investigate and, if necessary, call a Special Meeting of the Club to discuss the matter; then, if the majority so decide, the offending Member shall be expelled from the Club, and lose all interest or benefit in it, such decision to be taken by ballot, and not by show of hands.

XX.—A copy of these Rules shall be delivered to every Member, on election, by the Secretary; but no Member shall be absolved from the effects of the Rules on the plea of not having received it.

XXI.—In the event of any one being elected a Member of this Club, and not having paid his subscription in accordance with Rules XIII. and XV., he shall not be eligible for re-election unless he can show just cause to the Committee for such non-payment.

USEFUL RECEIPTS.

Mounting Prints in Optical Contact with Glass.—Apply a warm fifty-grain solution of gelatine to the face of the print, and immediately lay it face down upon the glass, applying a squeegee to ensure contact and freedom from air bubbles.

To Bleach Engravings.—Immerse the prints for one minute in Javelle water, and then wash thoroughly in water containing a little hyposulphite of soda. To prepare the Javelle water take four pounds of bicarbonate of soda and one pound of chloride of lime; put the soda in a kettle over the fire, add one gallon of boiling water, let it boil from ten to fifteen minutes, then stir in the chloride of lime, avoiding lumps. When cold the liquid can be kept in a jug or bottle, ready for use.

To Clean Paint Brushes.—When a paint brush is stiff and hard through drying with paint on it, put some turpentine in a shallow dish and set on fire. Let it burn for a minute until hot, then smother the flame and work the pencil in the fingers, dipping it frequently into the spirits. Rinse all paint brushes, pencils, &c., in turpentine, grease with a mixture of sweet oil and tallow, to prevent them from drying hard, and put them away in a close box.

To Make Water Colours Flow on a Photograph.—The greasy surface of an albumenised print not unfrequently repels water colours when applied to it. While prepared ox-gall will ensure their smooth flowing, one of the simplest and best methods of treating the print is to apply the tongue to the surface. After this dries the colours will 'take' to the surface and flow evenly.

To Identify Silver Chloride from Silver Cyanide.—In a mixture of silver cyanide and silver chloride, both constituents may be identified in the following way: If a particle of silver cyanide be examined by the microscope with a quarter-inch objective, it appears as an amorphous mass; but if a drop of ammonia be placed upon it and very gently warmed it will form distinct needle-like crystals. Silver chloride treated in the same way gives very minute octahedra.

PHOTOGRAPHING IN PUBLIC BUILDINGS, PARKS, OPEN SPACES, &c., IN LONDON.

As a rule, permission is readily given to photograph in the following public buildings, parks, open spaces, &c., in London. When making application, it is advisable to enclose a stamped addressed envelope.

British Museum.—Apply to the Principal Librarian, British Museum, Great Russell Street, W.C.

South Kensington Museum.—Apply to the Secretary, Science and Art Department, London, S.W.

Bethnal Green Museum, E., for National Portraits.—Apply to the Curator, 20 Great George Street, Westminster, S.W. Objects belonging to the Science and Art Department same as for South Kensington.

Westminster Abbey.—A form of recommendation can be obtained from the Chapter Clerk, the Sanctuary, Westminster, S.W.; it has to be signed by a member of Parliament, of the Royal Academy, a barrister or clergyman, and then sent to the Chapter Clerk as above.

Tower of London.—From the Constable of the Tower.

The National Gallery.—From the Secretary.

Public Record Office.—From the Secretary, Public Record Office, Chancery Lane, E.C.

Epping Forest, Wanstead Park, Burnham Beeches (Slough), Coulson Common, Highgate Wood, Queen's Park, Kilburn, West Wickham Common, St. Paul's Churchyard.—From the Town Clerk, Guildhall, London, E.C.

Houses of Parliament.—From the Secretary, the Lord Great Chamberlain's Office, House of Lords, S.W.

St. James's Park, Green Park, Hyde Park, Kensington Gardens, Regent's Park, Greenwich Park, Richmond Park, Bushey Park, Hampton Court Park.—From the Secretary, H.M. Office of Works, 12 Whitehall Place, S.W.

Windsor Park and Virginia Water.—From Captain Walter Campbell, Holly Grove, Windsor Park.

Kew Gardens.—From the Director.

Zoological Gardens, Regent's Park.—From the Secretary, Zoological Society, 3 Hanover Square, London, W.

Botanical Gardens, Regent's Park.—From the Secretary, the Gardens, Regent's Park.

For the following places, under control of the London County Council, apply to the Chief Officer, Parks and Open Spaces Sub-Department, London County Council, Spring Gardens, S.W.:—

Clissold Park, Finsbury Park, Victoria Park, Hackney Marsh, Dulwich Park, Blackheath, Plumstead Common, Battersea Park, Ravenscourt Park, Hammersmith, Waterloo Park, Albert Embankment Gardens, Hampstead Heath, Parliament Hill, Victoria Embankment Gardens, Brockwell Park, Kennington Park, Clapham Common, Chelsea Embankment Gardens, Streatham Common, Tooting Common, Wandsworth Common, Wormwood Scrubs.

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